

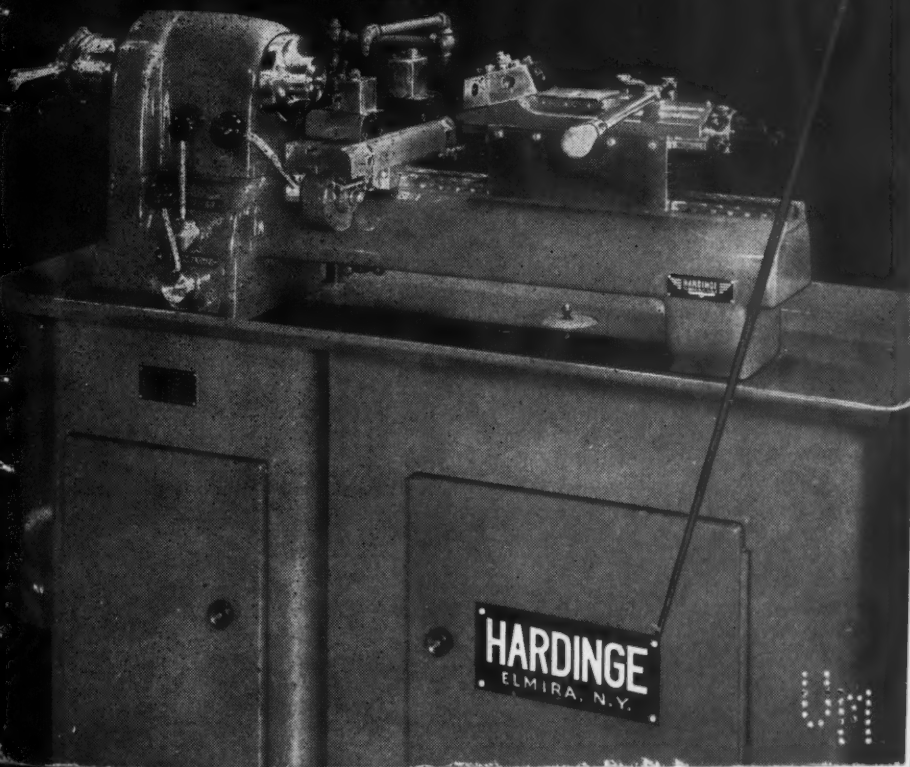
MODERN Machine Shop

December, 1944

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MODERN Machine Shop

VOLUME 17 • NUMBER 7

DECEMBER, 1944

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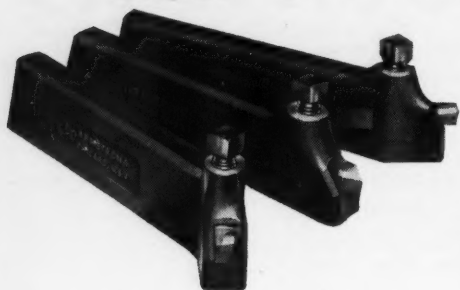
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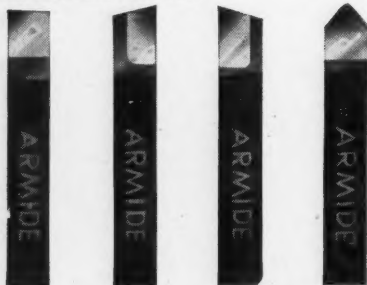
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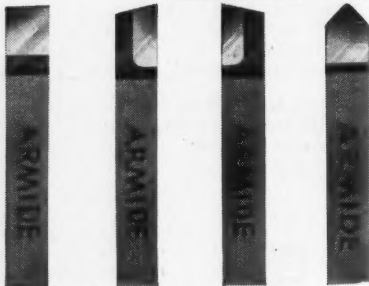
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VOL. 17, No. 7

CINCINNATI, OHIO

We Present ---

— as the feature article in this month's issue—"Short Cuts in Aircraft Production," a story of how the management of Lockheed has obtained outstanding production results by encouraging the use of mechanical means of material handling and fabrication wherever possible and by encouraging every Lockheed employee to present any ideas he may have for the more efficient performance of a job.

— on page 134—an article by Alfred M. Cooper in which the author outlines an undoubtedly practical and effective plan for helping correct the present unnatural labor situation.

— on page 160—the eleventh article in the series by Noel Brindle on the subject of "Tooling the Automatic Screw Machine." This installment covers the manufacture of long parts, presenting two examples to illustrate a method that may be employed to enable the screw machine engineer to use a small size machine for the manufacture of parts of considerable length.

— on page 178—an article from an English contributor which details the methods advocated by the British Wrought Light Alloys Development Association with regard to gas welding of aluminum alloys. The welding flame data on the available gases are here summarized.

— on page 216—a collection of "ideas" selected for their usefulness in helping the shopman obtain a more rapid and safe performance on various production jobs.

— on page 234—illustrations and descriptions of modern equipment being put to new and interesting use; followed by the regular "New Shop Equipment" section, cartoon, and other features.

— our best wishes for a Merry Christmas and a Prosperous and Victorious New Year!



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Short Cuts in Aircraft Production

Presenting some of the "ideas" that have been developed by Lockheed executives, engineers and employees to save time and material and step-up production.

By L. G. SMITH

Tool Planner, Lockheed Aircraft Corporation

THE management of Lockheed Factory A-2, faced with the problem of producing all the non-current spare parts required for service in addition to maintaining production on current models, has placed great emphasis on the utilization of production short cuts in order to maintain production

schedules. Mr. Roy Mackenzie, Superintendent of Manufacturing at Factory A-2, has obtained outstanding results by encouraging the use of mechanical means of material handling and fabrication wherever possible, and by encouraging every Lockheed employee to present any ideas that he may have as to the manner in which a given job should be done.

A typical example

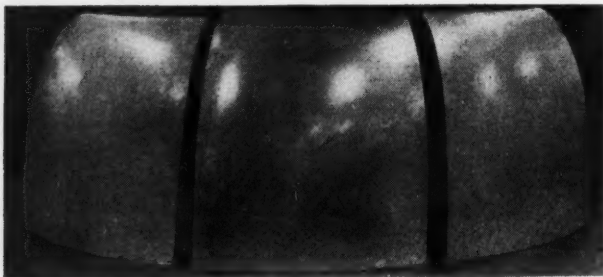


Fig. 1.—Three-Piece Skin Formerly Used on B-17 Engine Cowling



Fig. 2—The Forming Die for the Single-Piece Skin was Loaded from One End in order to Utilize the Full Stroke of the Press

of production short cuts is the conversion of the three-piece skin on the anti-drag ring of the B-17 to a single-piece skin. The anti-drag rings which are used to cover the power plants of the Flying Fortresses are each composed of three segments.

The original design called for each segment to be made in three sections, as illustrated in Fig. 1. Each of these sections had to be cut, formed, trimmed, mated, and assembled into segments, requiring the talents of skilled workers for each operation. The executives of Lockheed's Factory A-2 developed an idea for changing the three-piece skin to a single piece and, accordingly, developed suitable tooling in order to make the change.

The greatest problem was the forming of the part, and for this purpose a die was developed for the thousand-ton press. The die, shown set up in Fig. 2, was designed to load from

one end so as to take advantage of the full stroke of the press. The metal was cut with enough trim-stock to allow the die to grip it properly and to provide for concentration of forming wrinkles beyond the periphery of the part, as can be seen by reference to Fig. 3. Special trim-saw jigs that cut the two opposite edges in one operation were set up to trim the parts to the proper size, as shown in Fig. 4, producing the deep drawn single-piece skin ready for assembly. A finished piece is shown in Fig. 5.

A material saving of 50 per cent was effected by reducing the number of edge-trimming operations from six to two. In addition, a substantial reduction was achieved in production time, permitting skilled workers to be released for work on other assemblies.

Flanges on gussets and other small parts are normally formed at Fac-

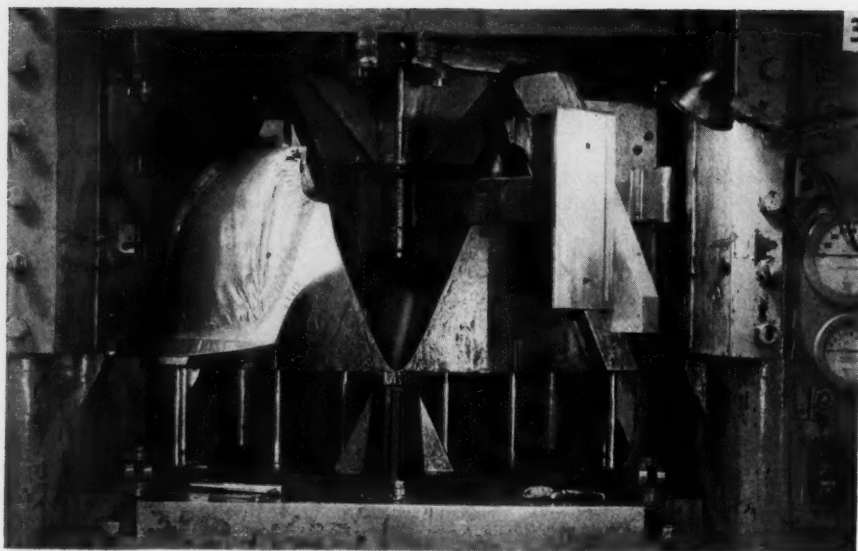


Fig 3—The Forming Die for the Single-Piece Skin Concentrates the Wrinkles Produced in Forming so that They will be Removed in the Trimming Operation

tory A-2 in a hydro-press. When these flanges are contoured, however, they generally require hand finishing on a forming block, due to the overforming required to allow for excessive "spring-back." To overcome this problem, a small, durable cam-action unit was developed which makes it possible to utilize the more consistent and rapid action of the punch press.

This unit consists of a small casting in which a vertical ram and a horizontal driver have been mounted. Dowels and bolt holes make it possible to attach any desired design of forming punch to the driver. The desired number of units are mounted in a die set on the lower dieshoe, and the forming block for the part is mounted above on the upper dieshoe.

As the die engages, the part is wiped over the forming punch, thus partially breaking the flange. The upper dieshoe then engages the ram of the cam-action unit, causing the driver to force the forming punch to

complete the forming operation. Production has been increased approximately 60 per cent on parts formed by this tool. The die is shown in Fig. 6. These cam-action units also effect a substantial saving in tooling cost, since they can be used interchangeably by the simple expedient of replacing the forming punch.

The installation of cowl fastener buttons has been converted from a dangerous operation to one which is now both rapid and safe. This job formerly was done on a pneumatic squeezer, operated by a skilled operator. The operator was required to hold and guide the part with one hand while he inserted the button with the other.

Inasmuch as the machine was foot-operated, the operator rested all his weight on one foot while manipulating the foot-pedal with the other. The fatigue element was rated very high on this job and it became necessary to change operators frequent-

ly in order to keep accidents at the minimum. A change in the method of handling the job was highly desirable from the standpoints of production, safety, and fatigue.

As is usually the case, the extra equipment required for the solution of the problem resulted in more than enough extra production to cover the cost. Now the buttons are installed with the same machine by means of a button hopper and an automatic feed chute.

The buttons are sorted in the hopper and travel down the chute by gravity. Each time the squeezer is operated, one button is released by an automatic selector and slides into the set. The set inserts the button into the part and seats it. This permits the operator free use of both hands to control and guide the workpiece while keeping his hands out of the danger zone of the machine, as shown in Fig. 7. Not only has production been increased, but—most important—injuries have been eliminated.

The bearings of an engine cowling flap are housed in an aluminum casting, each of the two ears on the casting housing a bushing that holds a bearing from each of two adjacent flaps. The holes for the bushings in the ears of the casting are drilled on center lines set at an angle of 160 degrees to each other. In the original drilling operation, the casting was located in a fixture and one hole was drilled, then the fixture was turned over and reset for



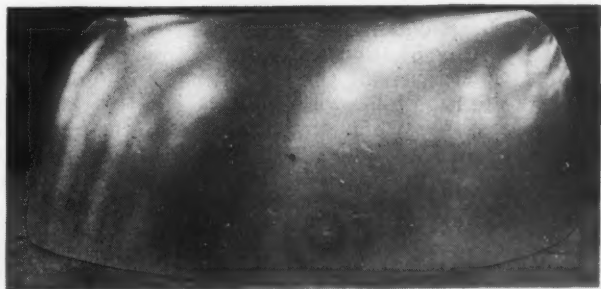
Fig. 5—The New Single-Piece Skin for the B-17 Engine is More Accurately Made and thus is Easily Assembled into the Mating Jig



Fig. 4—Two Edges are Cut Simultaneously by the Trim Saw, Resulting in More Accurate Trimming

drilling the second hole. A radial drilling machine was used for the operation and the job was a slow one. Changing the setting resulted in approximately 1 per cent scrap.

Under the new method that has been developed for this operation, the job is done on an automatic dual-head boring machine which has two boring heads mounted on separate plates that are hinged at a common



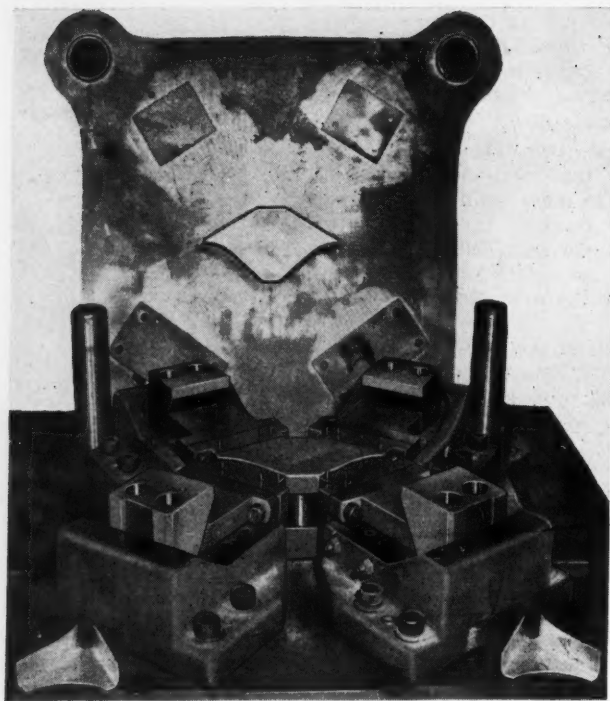


Fig. 6—Typical Dieset Mounted with Four Cam-Action Die Units. This Die Produces Two Parts with Contoured Flanges at Each Stroke of the Press



new dies for the production of airplane fuselage and wing sections—has always required a considerable amount of skill and accuracy. To make a pattern the outside mold lines of which are any part of a circle, the first operation consisted in building up a heavy layer of plaster on a large surface plate. Then a template which was hinged from the center of the plate would be rotated by

point. These plates swing across a mounting table marked with degree graduations. The heads are set at the correct angle and are locked, then the casting is placed in a nesting block where it is held by the arms of an air-actuated clamp.

Upon closing a valve, air is fed to one boring head through one ear of the casting. The tools in the head take a roughing and finishing cut, then the head automatically returns to the starting position as shown in Fig. 8. Upon reversing the air valve, the opposite head follows through the same cycle, thus completing the operation on the casting. The scrap has been reduced by 100 per cent, while production has been increased by 330 per cent.

The making of plaster patterns—a necessary part of the development of

the patternmaker to form the outline of the pattern by scraping off the excess plaster. This operation usually required the services of two or more men.

To perform this operation a much simpler and more efficient method has been developed in which a plaster spinning table is used. The table is essentially a circular surface plate with graduations in degrees and radii, mounted so that it can be rotated with power supplied through a gear reduction unit from an electric motor.

By clamping the outline template in the proper location from the center of the table, the plaster is now fed past the template for forming and the operation is controlled by one man, as indicated in Fig. 9. This newer method of spinning plaster patterns is faster, requires less man-

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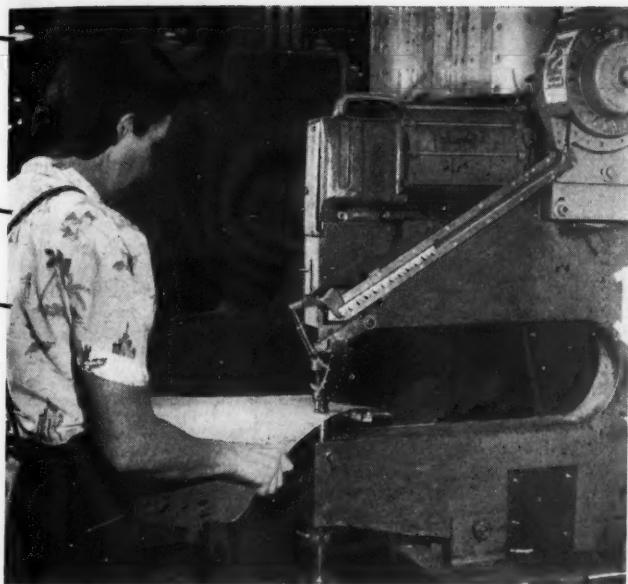


Fig. 7—Cowling Fastener Buttons Being Installed with the Automatic Feed. Note the Distance of the Operator's Hands from the Danger Zone



burrs were afterward removed and the hole edges sanded smooth, since a rough spot was liable to result in a crack. The part was then taken to a pneumatic squeezer and dimpled with a dimpling punch and die. Although

power, and is more accurate.

The operation of dimpling the half-inch holes for cowling fastener buttons, in view of the fact that the material was hardened aluminum, comprised a problem. Locating from a jig-drilled pilot hole, the half-inch hole was formerly spotfaced out or punched, whichever appeared most convenient at the time. The

the method employed was a sure and accurate means of working this difficult metal, it was a slow and therefore undesirable method of producing results.

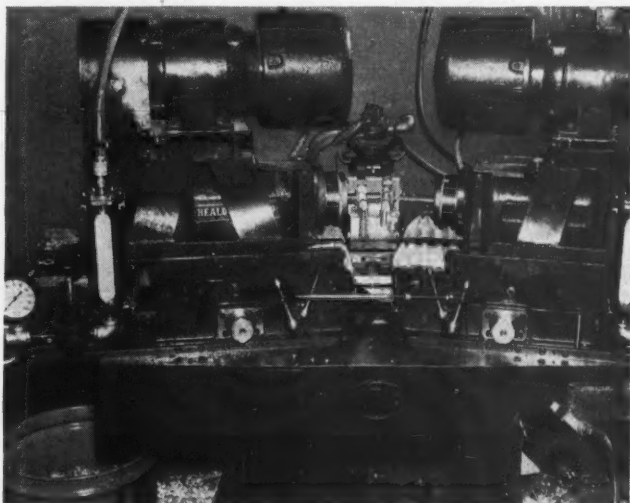


Fig. 8—Boring Cowling Flap Castings on Dual-Head Boring Machine. The Machine is Automatically Controlled from One Switch

December, 1944

MODERN MACHINE SHOP 129



Fig. 9—(Left to Right) Mr. Roy Mackenzie, Superintendent of Manufacturing, Mr. Clarence Miller, Foreman, and Mr. Francis Stevenson, Assistant Superintendent, Examine a Rough Cut Plaster Pattern on the Plaster Spinning Table

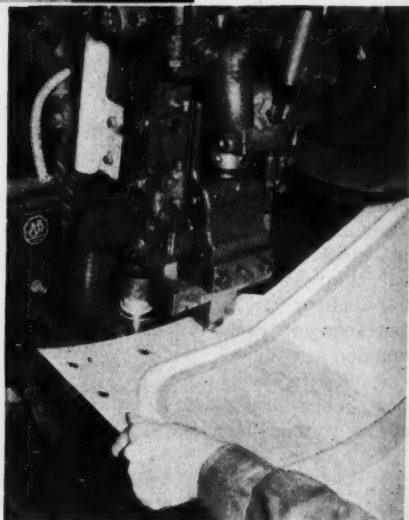


Fig. 10—Dimpling and Piercing Cowling Fastener Holes in One Operation on a Small Punch Press. The Material is 0.090 - Inch Thick Hardened Aluminum

More recently a method has been devised by which the operation is performed in a punch press die in a single operation, and without cracking the dimple. Since the cracks which occurred in the course of the previous operation resulted when the metal was drawn away from the center of the hole, the new die was designed so that it would perform the dimpling operation before the hole was pierced, thus permitting the metal to be drawn from the surrounding area into the center of the dimple.

After the dimple has been formed, the die pierces the hole to the required size as shown in Fig. 10. This die has been responsible for a high increase in production and has worked successfully on hardened aluminum up to 0.104 inch thickness.

The several production short-cuts outlined here are only a few of the many that have been developed by Lockheed so that production schedules can be maintained in spite of the man-power shortage.



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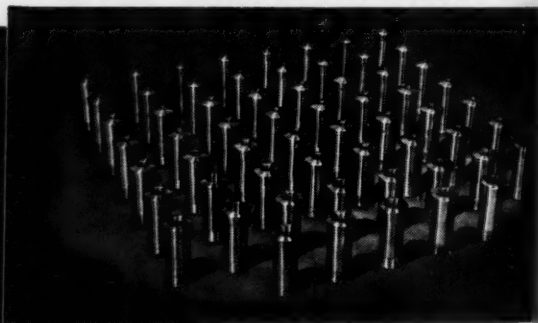
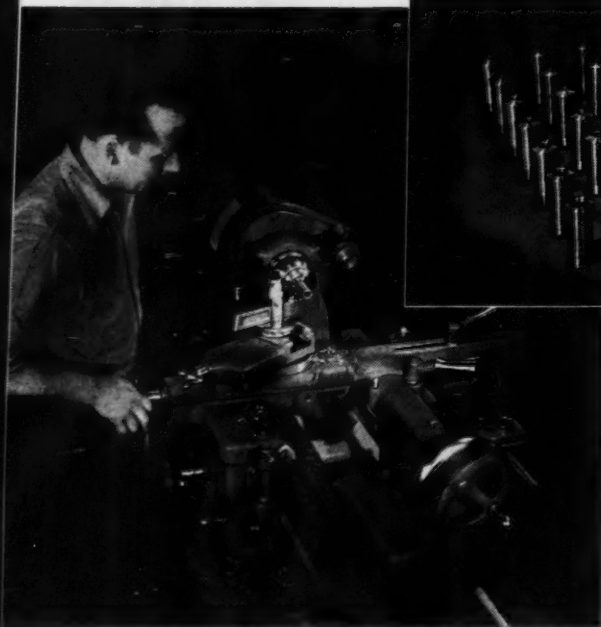
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Developing Employee Participation in Management

Most employers will grant that the labor relations situation is not, at the moment, ideal. The author of this article offers some suggestions which, if adopted, will unquestionably comprise a step forward in this all-important phase of industry

By ALFRED M. COOPER

IT should be obvious by now that there can be nothing lasting or permanent about our existing management-labor setup. If, sometime in the future, it should happen that a tax-burdened populace should decide that a conservative administration would best serve its needs in the reconstruction period that lies ahead, it is reasonable to assume that we would have less governmental interference in business and industry. And just as soon as governmental pressure is removed, the present relationship of management and labor must undergo a change. This is true, since only the most rigid support from Washington has sufficed to maintain our present unnatural labor relations.

At such a time as this it would seem the smart thing for management to devote a little thought to what its position will be in the event that governmental pressure is removed from industrial relations. As I see it, management then will have

two courses of action open to it, and now is the time to decide which road it wishes to travel.

We can either go back to the old dog-eat-dog industrial relations policy, in which, in recurrent periods, either management or labor is top dog, or we can right now formulate a brand-new policy that will solve the labor problem once and for all, and solve it to the complete satisfaction of both management and worker. In what follows I would like to outline a plan that, if properly carried out, will make permanent labor peace in this country a reality.

Fifty years ago, when our industrial development was just beginning, there was little labor strife in America. In the struggling young industries of that day everybody from top to bottom was trying to make a go of things; new ideas for methods and tools were continually being developed, and no one knew any too much about what he was doing. Any employee who had an idea that would

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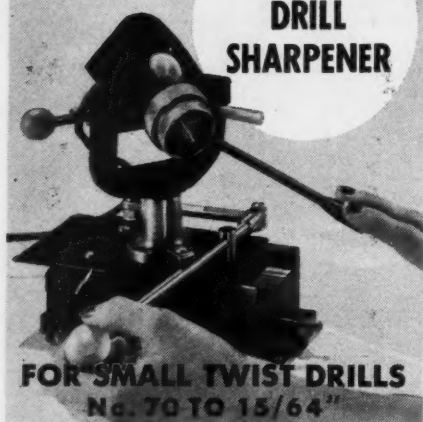
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work became, at once, more important to the success of the organization than any official of the company. In those days we had splendid cooperation between management and labor because every employee considered himself important to the welfare of his concern.

In the rapid expansion of our industrial economy that has taken place since those halcyon days, management has, somewhere along the way, discarded this fine, cooperative relationship with the employee and has attempted to substitute for it an artificial relationship that has not worked and never can be made to work.

Every paternalistic program in industrial relations that has been instituted since the turn of the century has been designed with the object of keeping intelligent employees happy after they have had taken from them all real responsibility for the success of their company. When management set itself apart from the worker and allotted to itself all of the interesting functions of research, planning, and execution, it left to the employee only the monotonous routine of his day's labor.

During a period in which universal education has raised the level of intelligence of the American workman to a high level, management has persisted in treating employees like children. In school, workers have been taught to think, but routine jobs in the shop and factory call for a minimum of thought. In removing from the employee all sense of responsibility for the success of his company, management has deprived him of the very incentive that developed in the early-day mechanic a sense of loyalty to his concern. And no program of sports activities, choral societies, or stock-selling campaigns ever has been able to make up to the employee for this loss of

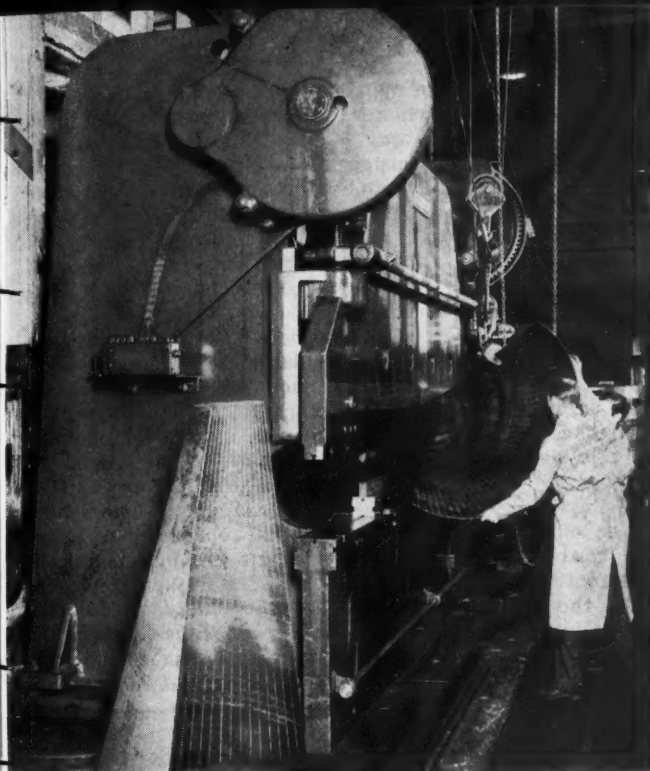
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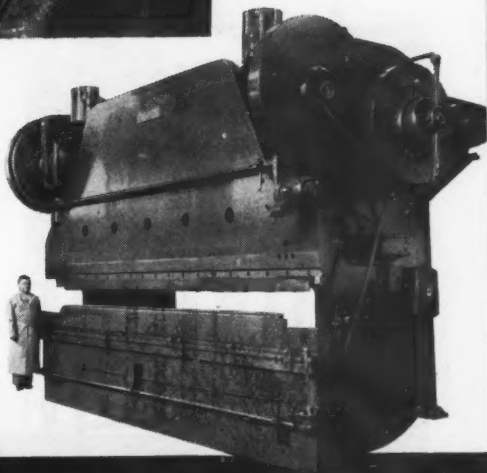
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his responsibility.

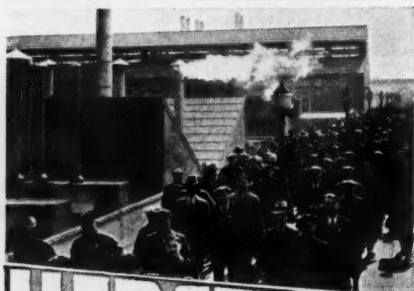
It should be obvious, therefore, that any plan for a lasting solution of our differences with labor must be based on a sincere effort on the part of management to narrow the gap existing between management and employee. This can only be done by deliberately setting up machinery that will return to the employee his sense of responsibility for the success of his organization.

This machinery must include a plan that will give the employee an important part in the management of his company. When this has been done, the schism now existing between management and employee will become so small that no outside interests ever again will be able to secure a foothold there; a foothold such as has enabled them in the past to dictate terms both to management and to the worker.

Employee participation in affairs

of management becomes a reality only when the individual employee is given a say in all important managerial decisions. Machinery must be set up by which the employees as a whole are afforded opportunities to pass on all matters of company policy, and this mechanism must not function through employee-management committees.

The weaknesses of the co-operative committee plan should be obvious. In the first place, as everyone knows, when a committee is appointed it is natural for those who have appointed it to pass the buck to the committee and forget all about the matter. Again, labor-management committees now in operation represent, in the labor half of each group, union leadership rather than the employees themselves. And finally, no committee of this type has been given the authority to act in the formulation of company policies that must be in-



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NICHOLSON FILES 
FOR EVERY PURPOSE

cluded in any genuine plan for employee participation in management.

If the individual employee is to be given a sense of full responsibility for the success of his company, he must have referred to him every important managerial problem that confronts his organization, be given an opportunity to study this problem, and then have an opportunity to express his opinion. Then, when an employee consensus has thus been obtained, the decision expressed by the majority of employees must be final and binding on management.

The only practicable method of setting up machinery which will secure bona fide employee participation in management is to institute a program of plant-wide employee conferences. A series of such conferences, in which every employee is given an hour or so to study the particular problem on which he is to make a decision, is scheduled whenever an

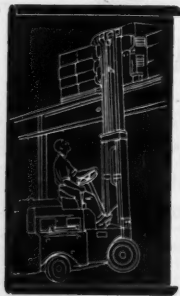
important matter of company policy is to be determined.

These meetings should be conducted in groups made up of not more than thirty employees, and the discussions should be led by the immediate superior of the employees comprising the group. In these conferences every bit of information bearing on the managerial problem to be solved must be placed before the employees and ample time allowed for a thoughtful discussion of these factors before a vote is taken. A tabulation of the decisions of all groups will indicate the wishes of a majority of the employees, and this collective decision will serve as a guide for management.

A plant-wide series of conferences, reaching 500, 5,000, or 50,000 employees, can be conducted without interfering in any way with production, within a period of three or four days. It is reasonable to assume that

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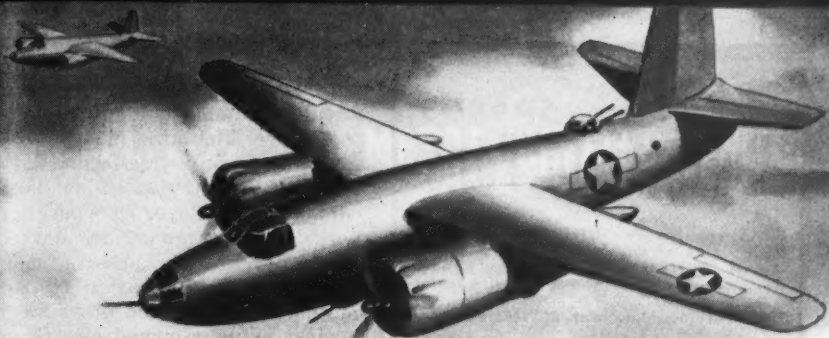
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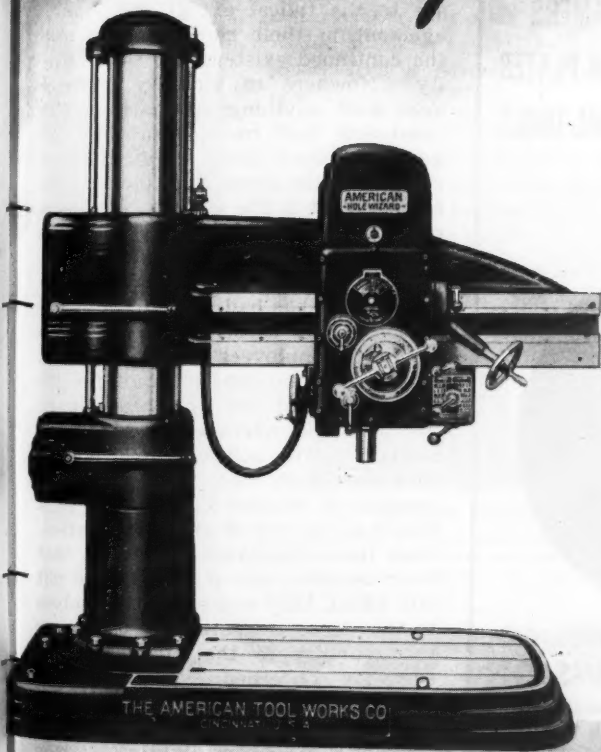
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When you specify BUTTERFIELD TAPS you can be sure of dependable results—second to none. BUTTERFIELD TAPS are proving their stamina and accuracy in many leading metal-working plants. Equip your machines with BUTTERFIELD TAPS for outstanding results.



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managerial decisions of an importance to justify such an employee referendum would come up not oftener than once a month.

The company-wide series of conferences as a method of securing complete employee cooperation in periods of emergency has never been made use of in private industry. However, I had occasion to use this method over a period of years in the largest publicly-owned electric utility in the world.

In this instance the program was installed at a time when it was imperative that each employee cooperate to the fullest extent with management in their common fight for the continued existence of their utility. Nowhere in industry have I even seen anything approaching the teamwork that resulted in that organization as a direct result of those company-wide series of employee conferences. It is the lack of this spirit of close cooperation that has been responsible for most of private industry's troubles with labor.

Until one has had experience in developing the consensus of a large group of employees on any subject, he will have no conception of the intelligence that will be brought to bear by the average good factory worker in the solution of problems that previously had been considered possible of solution only by the best brains at the top of the organization. Once these employees appreciate that their decisions are actually to be put into effect, they will exert themselves to the utmost to carry out their new responsibility to the satisfaction of everyone concerned.

Of course there will always be a few men and women who will treat the entire program lightly, or who lack the capacity to think intelligently, but these people are so very much in the minority that they have no effect on the final consensus express-

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So it is a fair assumption that we "know" circular saws. In fact we *have* to, because our reputation depends chiefly on this one product. No wonder circle "R" saws are good!

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ed by the employees on any question that has been submitted to them for decision.

In inaugurating any such unusual program as this it is important that the early managerial problems put up to the employees for decision be not too involved or difficult of solution. When cases in which engineering or technical data form an important part of the problem are to be decided by the employees, such data must be prepared and submitted in simple, understandable form as part of the material which is furnished each of the supervisors who lead the group discussions. These leaders, incidentally, must receive training in methods of leading discussions, and this matter can readily be taken care of by the plant training division.

It should be emphasized that the managerial problems to be submitted to employee groups in this type of program should not be confined to

matters which pertain only to the workers' conditions of employment. It would be a serious mistake to place any such limitations on the subject matter for the employee conferences. This is true, since the underlying purpose of the entire program is to develop in the individual employee a deeper interest in the problems that face the management of his organization, and many of these problems will only indirectly affect the workers' conditions of employment. This sense of responsibility will be most in evidence when the employee is debating a course of action in which the outcome has no direct effect on his wages, hours of work, or general working conditions.

Nevertheless, as the program progresses and the employees become accustomed to making important managerial decisions, it will be entirely safe to place before these groups problems which involve even

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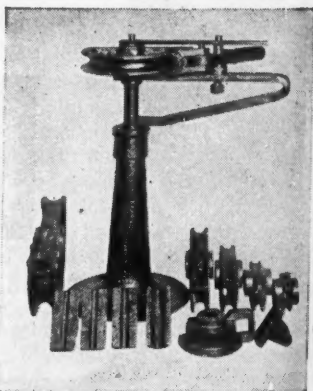
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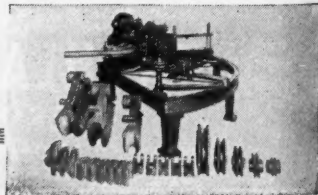
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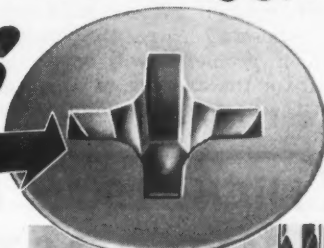
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, 1944

AS A WEAPON FOR KNOCKING PRODUCTION COSTS DOWN IT'S HARD TO MATCH THIS → THE SCREW WITH THE ENGINEERED RECESS THAT STEPS UP → SCREW DRIVING SPEED AS MUCH AS 50% → IT'S PHILLIPS

THE ENGINEERED RECESS



Right at your command is one of the most potent and efficient weapons for speeding up assembly and cutting costs that you could hope to find.

It's Phillip's - the Engineered Recessed Head for all kinds of screws.

It's the screw recess that eliminates fumbling, wobbly starts, slant driving, and dangerous skids - the troubles that have long made screw driving slow, awkward - and costly!

It's the screw recess that makes driving easier for workers - helps keep them going at top speed through a full shift.

It's the screw recess that lets you adopt spiral and power driving for assemblies where speed tools have never been practical.

Hundreds of plants have increased screw-driving speeds as much as 50% ... and cut costs correspondingly ... simply by switching to Phillips Recessed Head Screws. Can you do the same? Make the switch to Phillips Screws now - and you'll see. You'll see they cost *less* because they help you produce much *more*!



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The Loomis & Seaton Co., Cleveland, Ohio
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TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Faster Starting: Driver point automatically centers in the Phillips Recess ... its snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.



IDENTIFY IT!

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)



Smaller Driving: Turning power is fully utilized. Workers maintain speed without tiring.



Better Fastenings: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

Bottom of Phillips Recess is nearly flat ... NOT tapered to a sharp point.

such matters as increases or decreases in pay for the employees themselves. Anyone who fails to understand that this can be true, or who believes that the employees would take advantage of this situation to improve their own condition regardless of the effect of such action on the future welfare of the company as a whole, needs to have revived his faith in the essential rightness of the democratic way of life. Given half a chance, these people will surprise management with the manner in which they will accept, and discharge, their new responsibilities.

No one can predict with any degree of accuracy what industry's problems will be after this war is over. From past experience, however, we can assume that there will be a period of readjustment during which problems will arise that will call for the exercise of much patience on the part of both management and

the employee before we get squared off for peacetime production once more, and the decisions that are made will affect the employee as well as the stockholders of the company.

If there is in operation in any organization such a program as I have outlined, it will be found that employee cooperation, during what may well be a very difficult period for management, will remain at a very high level. The complete sense of responsibility entertained by the employee for the success of his company and the degree to which he is constantly kept informed of the difficulties facing management will, at such a time, result in a spirit of interdependence between management and employee that is today simply unknown in industry.

Let me cite a couple of examples of the type of managerial problem that might be put up to the employees for decision. In the first

NICHOLSON E-x-p-a-n-d-i-n-g MANDRELS CUT COSTS

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Set of 19 does the work of 193 solid arbors, for all bores from 1" to 7".



Type A is especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.



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TYPE A—STEP JAW DESIGN

| Size No. | Range of Bores Taken | Length Overall |
|----------|----------------------|----------------|
| 1A | 1/2" to 1" | 9" |
| 2A | 1" to 1 1/2" | 11" |
| 3A | 1 1/2" to 2" | 12 1/4" |
| 4A | 2" to 3" | 20 1/2" |
| 5A | 3" to 4" | 21" |

TYPE B—STRAIGHT JAW DESIGN

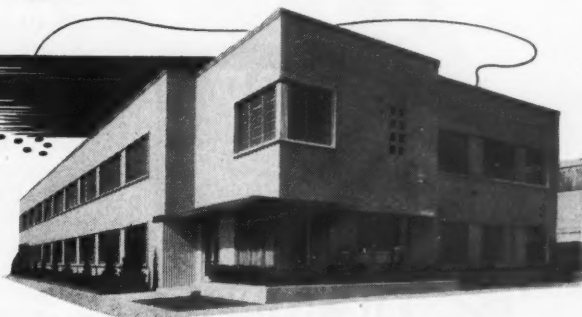
| Size No. | Range of Bores Taken | Length Overall |
|----------|----------------------|----------------|
| 1X | 1/2" to 1 1/8" | 5" |
| 2X | 1 1/8" to 2 1/32" | 6" |
| 3X | 2 1/32" to 3/4" | 6" |
| 00 | 3/4" to 7/8" | 8 1/4" |
| 0 | 7/8" to 1" | 8 1/4" |
| 1 | 1" to 1 1/4" | 9" |
| 2 | 1 1/4" to 1 5/8" | 11 1/4" |
| 3 | 1 5/8" to 2" | 13 1/4" |
| 4 | 2" to 2 1/2" | 17 1/4" |

(Other sizes taking up to 7" bores.)

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New product designs, lighter metals, new alloys and machine tools with increased feeds and speeds combine to create unusual and complex cutting tool design requirements. Illinois Tool engineers and metallurgists can bring to such problems a vast experience and unmatched facilities for the development and production of special tools that will exactly meet your needs. Consult an Illinois Tool engineer... you will find him capable of understanding and solving your difficult tooling problems.

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From The Hub of Air Transportation



December, 1944

MODERN MACHINE SHOP 147



\$29⁷⁵
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Weight 12 Ounces; Length 6 $\frac{1}{4}$ In.
Chuck Size $\frac{1}{8}$ In. Wheel Guard
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The Model JA is new in design both inside and outside. In it are utilized fewer parts, and they are made of Magnesium and Aluminum for extreme featherweight lightness. The alloy steel shaft diameter is unusually large for sustained smooth and true operation. This means still longer wheel life and better grinding. The speed, as before, is governed at 50,000 R.P.M. and there are selected ball bearings, front and rear. The JA Featherweight is a distinct improvement over all models previously produced by Madison-Kipp, the originators of really high speed grinders.

The same low price, \$29.75 in U.S.A., remains. It is a post-war design for which materials have been released early. The pre-announcement output was geared to expected demand. Deliveries will be made out of stock as long as possible.

MADISON-KIPP CORPORATION
208 WAUBESA ST., MADISON 4, WIS., U.S.A.

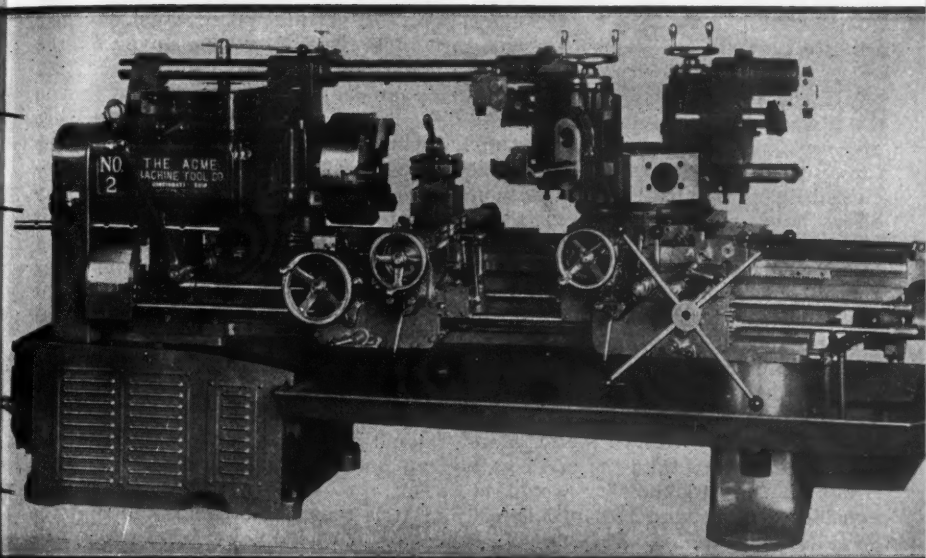
instance, let us assume the case of a plant employing 5,000 people which has been turning out parts for airplane manufacture. This plant finds itself, at the close of the war, without any military contracts and with only nominal peacetime production in sight for some time to come.

Ordinarily, in such a situation, management must decide at once to what extent it will be necessary to reduce its working force during the slack period, and what steps must be taken to increase production of needed consumer goods. Such managerial decisions are often worked out on a basis of what is best for the company's stockholders, rather than what is best for the company as a whole. If the employee's angle is considered at all it is done merely in passing, with a regret that so many people must be thrown out of work at this time.

If this same problem were to be put up to the employees of this plant for solution, these people might at once determine how much of a cut in pay each of them could absorb, in order that as many as possible of their fellows could remain on the payroll. But further than this, I would gamble that from somewhere among the 5,000 brains that were thus put to work on this problem there would come a whole flock of ideas for getting new business in a hurry—ideas that had never occurred to the half-dozen overworked brains that had been struggling for weeks with this problem in the front office.

As I have said, there is a power in the collective brainpower of a large group of employees that has never been properly exploited by management. The nearest we have come to this is through the medium of the suggestion box, and in that method of encouraging employees to submit ideas, however praise-worthy, there is present none of that competitive

Power and Speed



This Cincinnati-Acme No. 2 universal turret lathe is rigidly constructed to provide accuracy under heavier cutting at top speed.

Head and bed are combined into one rigid, well braced casting — cross ribbed the entire length to carry great loads without vibration.

Other salient features include - -

- Quiet high speed transmission
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THE ACME MACHINE TOOL CO.
CINCINNATI • **OHIO**

mental sort which has made the business conference so productive of new ideas.

Here is another case that is common today. A privately-owned electric utility has been having hard sledding because of governmental competition. It has received an offer for its properties from the opposition—an offer that will leave a nice profit for the stockholders if the deal is closed. Too frequently of late such offers have been snapped up by the management of the utility corporation, despite the fact that every time a power company sells out to a governmental bureau, the entire power industry moves one step closer to complete socialization.

If the decision to sell or not to sell were put up to the employees of this privately-owned utility, many more important factors than the immediate profit to the stockholders would be considered in solving this problem.

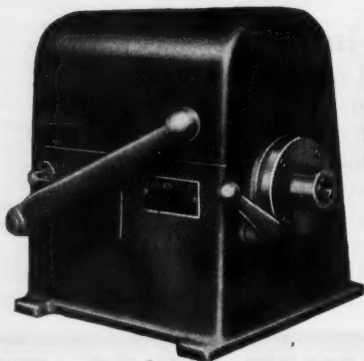
In the first place, the employees would have to decide whether or not they wanted to work under civil service. Then they would know that only a certain percentage of their number would be taken over by the government-owned utility, and the remainder would be jobless. And finally, as in the previous case, there would unquestionably be many fine ideas developed in the employee conferences that might conceivably prune operating expenses to a point at which the harrassed private utility could ride out the storm until a government less antagonistic to the power industry was in control at Washington.

In every such case that has come under my observation in the past ten years, I am positive the employees would have voted solidly against selling out to the governmental opposition.

It is reasonable to assume that the

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A recent addition to the COLBORNE line of Speed Lathes is the Series 30 machine. This speed lathe is indispensable for economical polishing, grinding, burring and lapping.

Very compactly constructed to do highest quality work with the COLBORNE features of spindle bearings running in oil, instant stopping brake, easy opening collet and standard speeds of 600-920-1720-3280-4800 RPM using $\frac{1}{4}$ H.P. motor and cone pulleys. Collets and chuck may be used.

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TOOLS



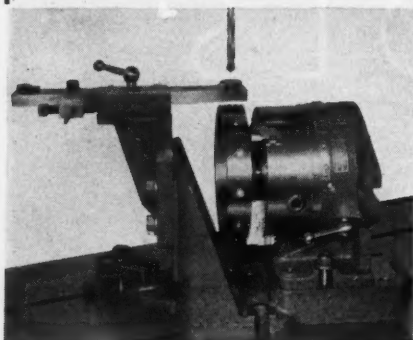
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A NEW, SUPER HIGH-SPEED, TOOL STEEL WITH, (1) ALL THE DISTINCTIVE FEATURES OF "CENTRIFUGALLY CAST" ALLOYS, (2) HIGH WEAR RESISTANCE DUE TO THE PRESENCE OF BORON AND (3) A MAXIMUM RED HARDNESS IMPARTED BY TWENTY PERCENT COBALT.

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HARTFORD 'SUPERSPACER'

for Drilling Operations



The Hartford Super-Spacer is a tool of exceptional value for the rigid control of accurate machining operations within its scope.

The illustration shows a Hartford Super-Spacer provided with a DRILLING ATTACHMENT and supplemental base to handle variations of diameter and length in radial drilling. Set up time is negligible.

There are so many jobs that can be done with greater speed and economy through the use of the Hartford Super-Spacer that it will pay most shops to investigate its wide possibilities.

**THE HARTFORD
SPECIAL MACHINERY CO.**

HARTFORD 5

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employees of any corporation would at times make mistakes in solving managerial problems. In this respect, however, they would not differ greatly from management, and over a period of years the employees would make few decisions that were not in the best interest of the company.

However, it should be borne in mind that the real purpose behind any program of employee participation in management is not so much that of improving management as it is to bring management and employee into a closer cooperative relationship. As I have indicated, this new setup would make union membership much less important to the employee, because he would then be in a position to look after his own interests without outside assistance. For those employees who have felt the need for someone to fight their battles with management, this arrangement would remove all necessity for fighting for their rights. And for those 10,000,000 industrial employees who have been forced against their will to join labor unions as a condition of obtaining employment in our war industries, this new setup would come as a most welcome deliverance.

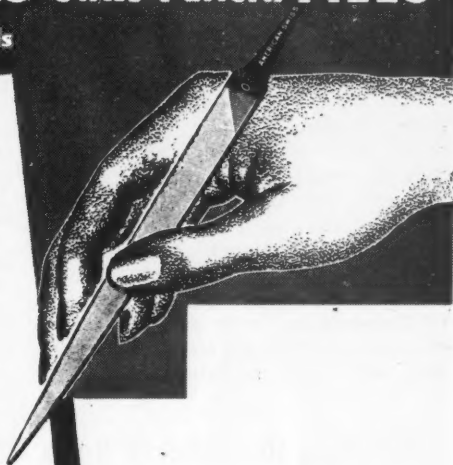
On the other hand, however, there is nothing in this plan to preclude employee membership in any labor union, and it is certain that those older unions and brotherhoods which have proved by their records their earnest desire to promote increased cooperation between management and employee would welcome this new arrangement. Only the opportunistic politician and the racketeering type of labor leader would resent bitterly this effort of management and employee to work in closer harmony with one another. Unquestionably, the adoption of any plan to increase employee participation in manage-

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ment would mean the end of all despotism in our labor organizations, and you may be sure this change would be welcomed as much by the average employee as it would be by management.

The present situation in our labor relations can continue at best for only a little while longer. Realizing this, it would seem that this is the time for management to decide on a long-term labor relations policy that will really work, both in good times and in bad. A plan to encourage employee participation in affairs of management such as I have here outlined might prove to be the permanent solution to our labor problem.

Welding the Liberty Bell

A recommendation has been made by The Lincoln Electric Co., Cleveland, Ohio, that the Liberty Bell be restored so that

the people of the United States and of other nations may again hear this famous bell ring out in the true, full tone befitting the symbol of liberty. Engineering studies made by a welding consulting engineer for the Lincoln Electric Company disclose that it is practical to repair the crack in the Liberty Bell by welding, using the manual arc method with carbon electrodes.

The findings from these studies suggested that a 3/4-inch hole be drilled at the upper end of the crack over the crown to make certain as to the exact location of the end of the crack. Preheating of the entire unit to a temperature between 200 and 300 deg. by burners mounted inside the bell would be necessary while welding outside the bell and vice versa while welding inside. The bell should be mounted so that welding beads can be placed alternately first from the outside and then from the inside to equalize shrinking stress. Since the casting contains 20 per cent tin, peening must be controlled so that the metal will not be injured by the blows of the hammer.

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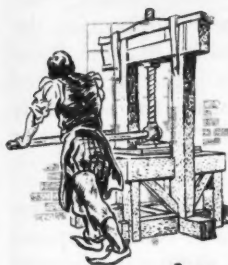


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IN the same manner that so many complex machines, essential to Man's progress, developed from the fundamental principle of the screw, so too, has broaching developed from crude tools capable of limited uses, to mighty machines capable of performing metal removing operations with speed and precision, in an almost endless variety of shapes and sizes . . . and making them quicker, cheaper and **BETTER!**



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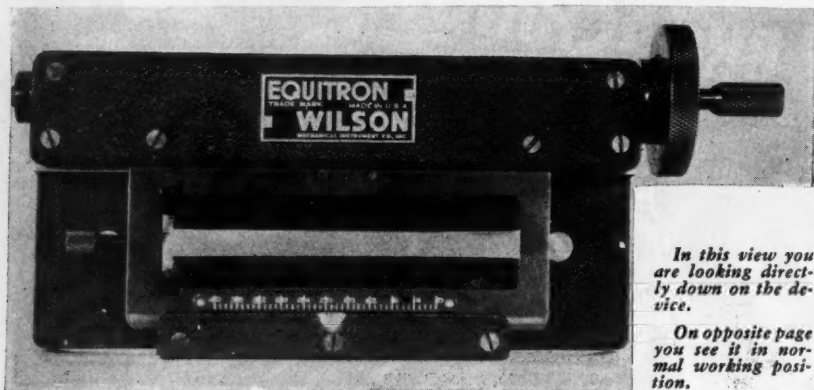
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Accurate spacing of the indentation is accomplished by a wheel and handle located at one end of the fixture. One revolution of the wheel provides a motion of the specimen of $1/16$ of an inch. A ball click indexing mechanism indicates each $1/16$ " spacing, so one need pay little attention to the scale markings. The specimen is securely held in positive indexed position by spring pressure. This jig permits tests to be made up to $2\frac{1}{2}$ inches from the quenched end of the specimen, and a scale is provided to indicate the positions at which the test is being made and to facilitate tests at greater intervals than $1/16$ " if it is desired.

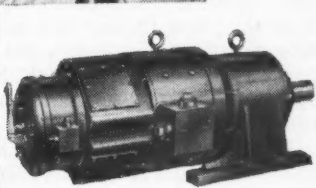
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Tooling the Automatic Screw Machine, XI.

Producing Long Parts on a Small Size Machine

By NOEL BRINDLE

WHEN planning for the manufacture of a long part in the automatic screw machine, the engineer may be guided by the length of the part in choosing the size of machine to be used. In this article, two examples are presented to illustrate a method that may be employed to enable the screw machine engineer to use a small size machine for the manufacture of a part of considerable length.

The drawing Fig. 1 illustrates a part which is $5\frac{1}{2}$ inches long, with a 0.125-40 pitch thread and a centered hole at one end. A straight knurled portion is located $\frac{1}{4}$ inch from the opposite end. The diameter of the rod is $\frac{1}{8}$ inch.

In studying the dimensions at first glance, it would seem that a Brown and Sharpe type automatic screw machine of the 2G size would be required to make this part, although the diameter of the stock could be accommodated in a No. OOG machine.

The part will be made from hard brass rod, which can be machined at the fastest spindle speed available. The machining time in seconds required to make the part shown in Fig. 1, using the 2G machine, would be twice as much as the seconds required on the OOG machine. The reason for this difference may be

found by comparing the maximum spindle speeds of the two machines. On the 2G automatic screw machine a speed of 3,000 r.p.m. is available, while the OOG size machine provides a spindle speed of 6000 r.p.m.

Therefore, if it is at all possible to make the part shown in Fig. 1 in the OOG machine, the possible results will justify a careful consideration of the method to be used.

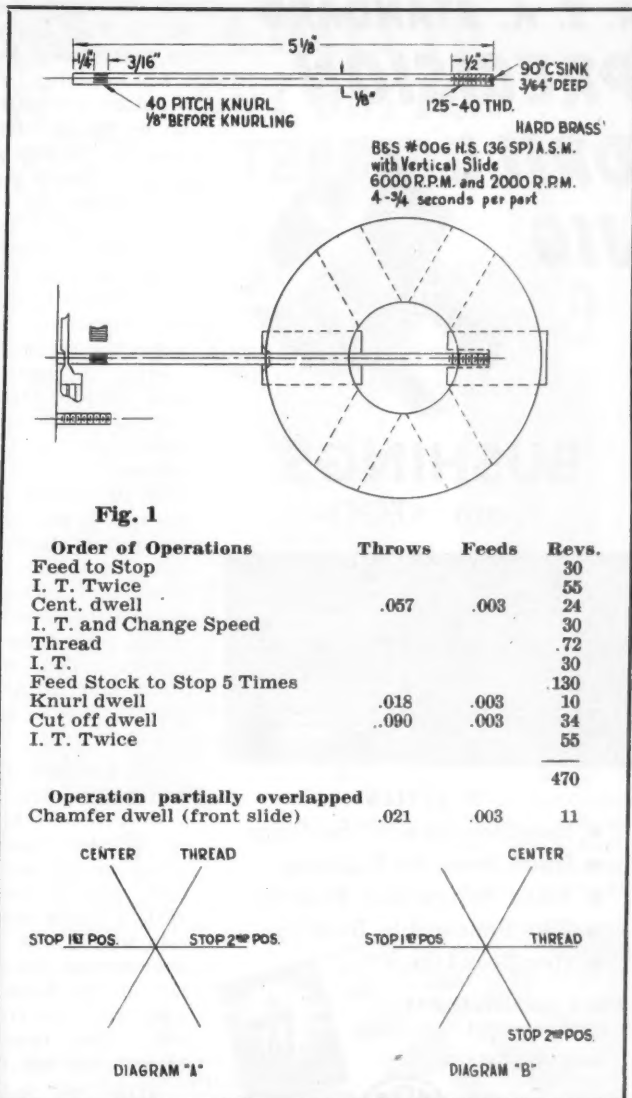
Although the part is $5\frac{1}{2}$ inches long, it will be noted that the length of the threaded portion at one end is only $\frac{1}{2}$ inch long. This length could be easily accommodated in the OOG machine. Therefore, the stock could be fed out for a short distance, sufficient to allow the front of the die head to clear the chuck nut on the spindle during the threading operation. After the threading operation had been completed the turret could be indexed and the stock fed forward.

It should be realized that the maximum distance from the chuck to the front of the turret is only 3 inches. However, if a circle representing the diameter of the turret is drawn in the chuck sketch as shown in Fig. 1, it will be apparent that there is no reason why the part should not be fed through one of the six holes in the turret and allowed to come in contact with a special hollow stop

located in the opposite hole. After considering this arrangement, it may be assumed that the OOG machine may be used to make the part.

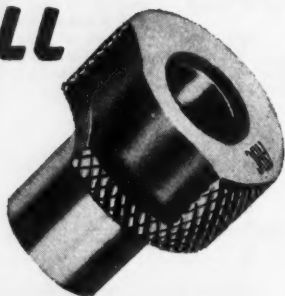
As mentioned previously, the use of the OOG size of machine will provide a maximum spindle speed of 6000 r.p.m., which is desirable when machining brass rod. In the threading operation the speed of the work spindle will be reduced to 2000 r.p.m. A reference to page 273 of the Brown & Sharpe Handbook shows that the 6000 r.p.m. may be used in conjunction with either 2000 r.p.m. or 1200 r.p.m. The slower r.p.m. would be used when a larger diameter thread with a much coarser pitch was required.

In preparing the chuck sketch, the part will be drawn to scale, as shown in Fig. 1, followed by the positioning of the cutoff blade and a chamfering tool at the end of their cut. The knurling tool will also be shown in its proper location.

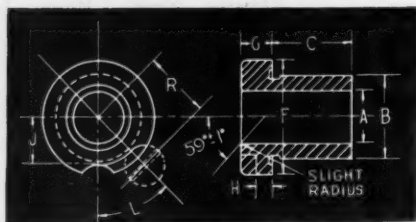


The order of operations should now be chosen, and it is probable that the first attempt to decide on the sequence of operations would compare

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with the method shown in Diagram "A" in Fig. 1. The diagram shows the location of the turret tools and it will be noted that it is not possible to obtain a condition where the part can be fed through an empty hole to come in contact with a special stop in the opposite hole.

To obtain the above setting, reference to Fig. 1 will show that it is necessary to allow sufficient time to index the turret twice between the first feeding to stock and the centering operation. Diagram "B" illustrates the results obtained.

After the centering operation has been finished, the turret is indexed and the spindle speed is changed from 6,000 r.p.m. to 2,000 r.p.m. This is followed by the cutting of the 0.125-40 thread. The turret is then indexed again, followed by the feeding of the stock for five feeding cycles of approximately 1 inch for each movement. The five feedings will advance the stock through a bushing in the front hole of the turret to the special hollow stop held in the opposite hole in the turret. This operation is shown clearly in the chuck sketch Fig. 1.

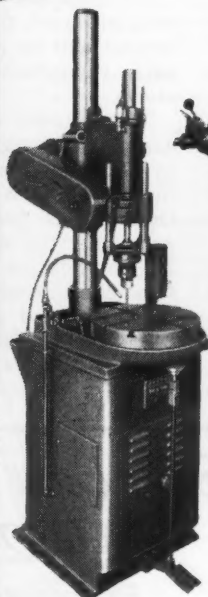
The knurling operation will next be performed. The knurl will be held in a B & S side knurl holder mounted on the back cross slide. Immediately following the knurling operation, the part will be severed from the bar with a blade held in a vertical slide attachment. A general-use circular chamfering tool will break the corner of the back end of the finished part and the front end of the next one. This operation will be overlapped into the cutting-off operation.

After the finished part has been severed from the bar, it will be necessary to allow sufficient time to index the turret twice. This will bring the first turret stop in line with the spindle. It can readily be seen that if the turret was indexed during the

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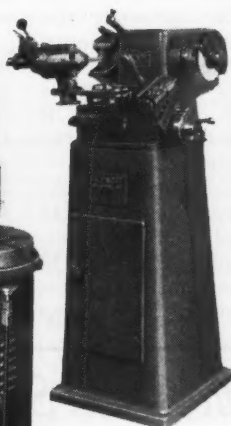
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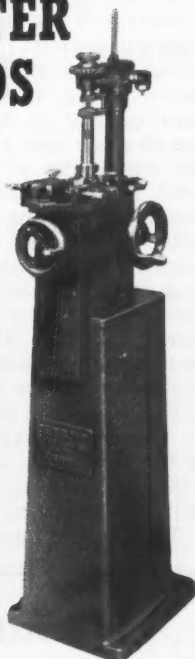
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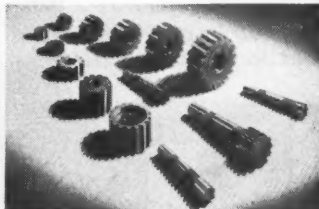


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cutting-off operation, which is the customary procedure, the part would be broken from the bar.

The throw for the centering operation will require 0.010 inch to approach the work plus the $\frac{3}{64}$ inch shown in Fig. 1, while the throw for knurling will be figured by dividing the 40 pitch into 1 inch and dividing the answer by 2. An approach of 0.005 inch will then be added. The throw for cutting off the part will equal 0.005 inch to approach the work, plus half the stock diameter, plus the depth of the angle on the cut off blade for $\frac{1}{8}$ inch stock as shown on page 251 of the B & S Handbook, plus 0.005 inch to pass the center line of the spindle.

The feeds per revolution will next be chosen by referring to page 248 of the Handbook, and they will be divided into the number of throws to obtain the cutting revolutions.

To find the number of revolutions

required to feed the stock and index the turret, it will be necessary to refer to page 273 of the Handbook. Under the 6,000 r.p.m. spindle speed, it will be noted that 25 revolutions are shown. A few extra revolutions will be allowed to facilitate setting up the machine.

To calculate the time required to feed the stock five times, the 25 revolutions will be multiplied by 5 and 5 extra revolutions added as mentioned above.

The number of revolutions necessary for threading will be determined by allowing 20 revolutions for threading a half inch length of a 40 pitch thread, plus four revolutions for approaching the work. This will equal 24 threads or revolutions at the threading speed of 2,000 r.p.m. or 72 threads based at the fast speed of 6,000 r.p.m. This figure will be entered in the "revs." column in Fig. 1.

The revolutions are now totalled

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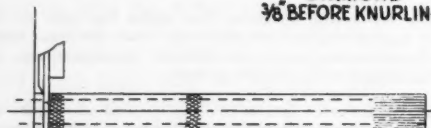
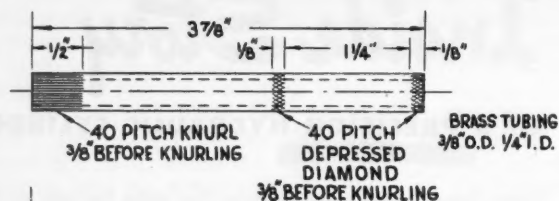
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I. T. Twice

Knurl on

Knurl off

I. T.

Feed stock twice to Comb. Stop

and Support

Knurl dwell (Front Slide)

I. T.

Feed stock twice to Comb. Stop

and Support

Cut off dwell

I. T. twice

Throws Feeds Revs.

30

55

26

13

30

55

10

30

55

44

55

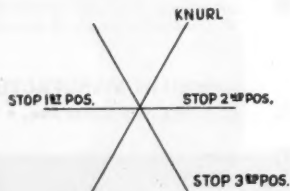
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403

Operation partially overlapped

Knurl dwell (Front Side) while cutting off

.018 .003 10



A

DIAGRAM "A"

Fig. 2

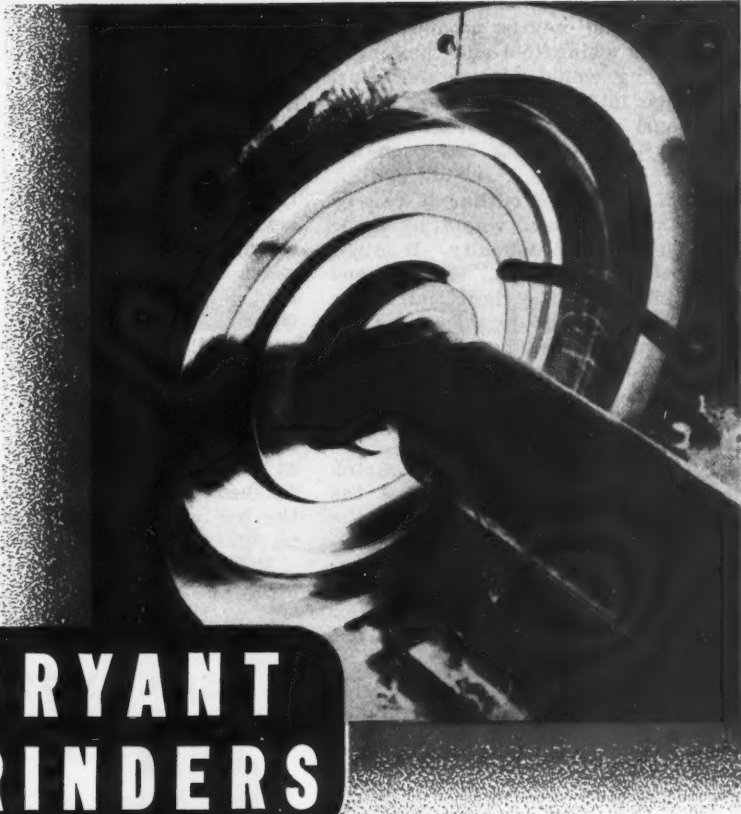
available number of 470 is 475 revolutions. Under the "Time in seconds to make one piece" column, 4 3/4 seconds are shown.

In Fig. 2 is shown a long part with a straight knurling at one end and a diamond knurling at the other end. Another diamond knurling is located near the center of the piece. It will also be noted that the diamond knurlings are identical. The part is made from brass tubing and a No. OOG B & S High Speed Automatic Screw Machine will be chosen. This will allow a spindle speed of 6,000 r.p.m. to be used.

In the drawing at the top of Fig. 2 the part has been positioned in the manner shown to provide for an interesting discussion. Assuming that an engineer decided that the part should be made in the position indicated, it would be neces-

sary to produce the two diamond knurlings using either a side knurl or a knurling swing tool. The straight

and, referring to page 273 of the Handbook, it is found that under the 6,000 r.p.m. column, the nearest



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knurling shown on the left end of the part could only be produced with a knurling swing tool and the length of knurling would require the knurl to be fed into the work, after which the knurl would travel forward until the $\frac{1}{2}$ inch length has been obtained.

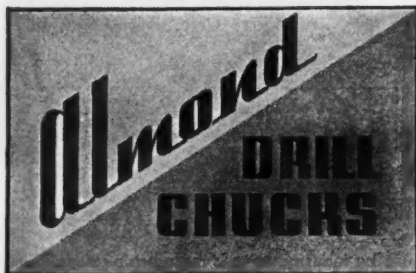
From the above outline it can be seen that the part would be made with considerable difficulty. It might also be mentioned that the diamond knurl shown at the right end of the part could not be produced with a turret knurl holder, because it is not possible to produce a satisfactory depressed diamond knurling by using this method as the knurls "will not track."

By referring to the chuck sketch in Fig. 2 it will be noted that the part has been turned around from the position shown at the top of the illustration. This arrangement allows the part to be made with a simple

sequence of operations. It is interesting to note that the most complicated operation by the previous method, the straight knurling, becomes the easiest one when the part is "turned around."

Because of the length of the part, it is necessary to feed out the stock three times. The first feeding is followed by the turret knurling operation. The stock is again fed forward and a raised diamond knurl, held in a side knurling holder on the front cross slide, produces the depressed diamond knurling. The stock is then fed out for the third time a sufficient length to allow the knurl on the front slide to again produce a depressed knurling. This is located at the cut-off end of the piece. The finished part is then severed from the bar with a cut-off tool mounted on the back cross slide.

It will be noted that there is an aftercut on the circular cut-off tool



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which chamfers the front end of the next piece. This provides an easier cutting action when the turret knurl holder is advanced into the work.

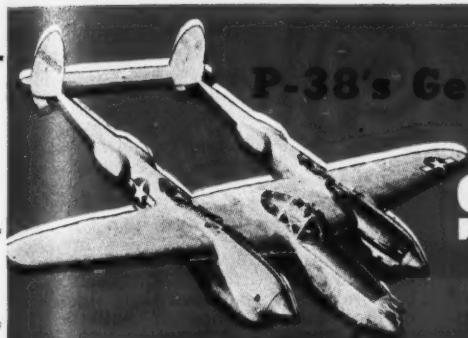
In the order of operations, it will be necessary to allow sufficient time to index the turret twice between the first feeding and the turret knurling operation. This is to ensure that the third feeding will advance the stock through an empty hole in the turret to come in contact with a stop in the opposite hole. This is shown in Diagram "A" in Fig. 2.

While the part is being severed from the bar, it will not be possible to index the turret because the part would be "broken off" if this were done. For this reason enough time will be allowed, following the cutting off operation, to index the turret twice. This will bring the first turret stop into feeding position.

The number of throws required for the cutting operations may now be determined. The knurling throw will require 0.010 inch to approach the work, plus the $\frac{1}{2}$ inch length of cut required. The same amount will be allowed when the knurl is withdrawn from the work. The throw required for the side knurling operation may be calculated as follows: The 40 pitch knurl refers to the number of teeth per inch of circumference, therefore the distance from the top of one tooth to the next one will be 0.025 inch. Half of this distance will be required for the knurl to cut into the work. Another 0.005 inch will be added for approach.

The throw required to sever the piece from the bar will require 0.005 inch for approach, plus the wall thickness of the tubing, which is $\frac{1}{16}$ inch, plus the depth of the angle of a cut-off tool 0.050 inch wide, plus $\frac{1}{32}$ inch for the heel of the cut-off tool to pass the edge of the hole in the tubing.

The feeds per revolution for the

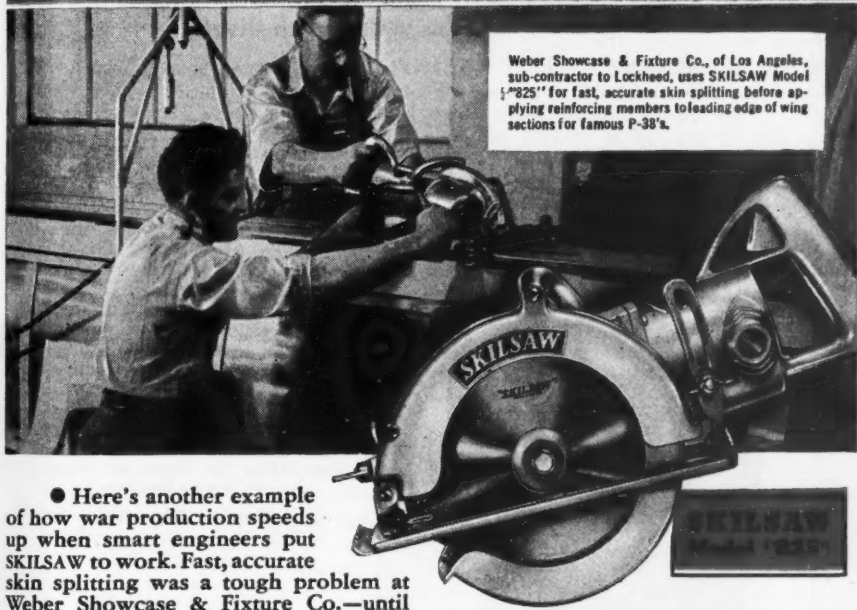


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● Here's another example of how war production speeds up when smart engineers put SKILSAW to work. Fast, accurate skin splitting was a tough problem at Weber Showcase & Fixture Co.—until Weber Engineers solved it by putting SKILSAW Model "825" into a specially designed jig. Now, wings for P-38's roll off the assembly line faster, because SKILSAW is saving *time and manpower* on an important step in production.

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cutting operations will be chosen from the B & S Handbook on page 248. The feeds may then be divided into the throws to obtain the cutting revolutions.

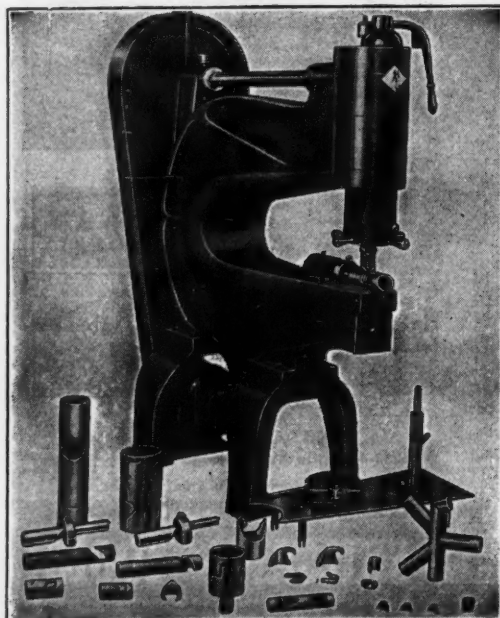
The revolutions required to feed the stock and index the turret are shown on page 273 in the B & S Handbook under the 6,000 r.p.m. column. A few extra revolutions are added to aid in setting up the machine. Where the turret is indexed twice, the 25 revolutions are multiplied by 2, then five extra are added. When the stock is fed to the stop twice in succession, the same procedure will be followed.

The revolutions should now be tallied. This figure equals 403. On page 273 of the B & S Handbook, under the 6,000 r.p.m. column, it is shown that 400 revolutions is the nearest available figure. In the "Time-in seconds to make one piece" column at the right, it is shown that 4

seconds will be required to make the part.

"... for Precision Products" is the title of an eight-page bulletin which illustrates and describes the various types of special cutting tools that can be produced by the American Cutter & Engineering Corp., 31743 Mount Rd., Warren, Mich. Special tools treated include milling cutters, shank tools, form tools, and miscellaneous tools (including carbide tools). Copy of bulletin free upon request.

"Die Handling Made Easy" is the title of a six-page bulletin issued by the Lyon-Raymond Corp., 1528 Madison Ave., Greene, N. Y., illustrating and describing the various types of hydraulic die handling trucks offered by this firm. Also pictured and described is the Lyon-Raymond Portable Hydraulic Elevating Table for handling heavy dies, jigs, and fixtures. Copy of Bulletin 135 free to plant executives upon request.



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For cutting flat sheets by template or to a scribed line.

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Wall thickness to $\frac{3}{8}$ "

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CONCUSSION

... and for these threaded "pin size"
parts they chose a strong,
corrosion-resistant INCO Nickel Alloy

The enemy isn't the only one to feel the shattering shock of a naval broadside. When the big guns thunder, everything aboard ship takes a beating.

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The metal chosen for this fastening needs:

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All of these requirements add up to "R" Monel... the corrosion-resistant alloy for parts where extra machinability is important.

* * *

This use of "R" Monel is cited as an example of how INCO Nickel Alloys... such as "R" and "KR" Monel... often do the trick where a *unique combination* of properties is required.

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British Practice in Gas Welding of Wrought Aluminum Alloys

By E. R. YARHAM

England

ALUMINUM has been welded successfully for over 40 years—and this method of assembly is being increasingly used—yet the experience in England is that there are still many people in industry to whom the welding of aluminum and its alloys remains something of a mystery.

This paper details the methods advocated by the British Wrought Light Alloys Development Association with regard to gas welding, one of the most widely employed fusion methods. The welding flame data on the available gases are here summarized.

| Maximum Flame Temperature | | | |
|---------------------------|-------------------|----------------|-----------------------------------------|
| Gas | With Oxygen °C | With Air °C | Average Quantity of heat/cu. ft. B.T.U. |
| Acetylene | 3,120 | 1,755 | 1,450 |
| Hydrogen | 2,300 | 1,700 | 345 |
| Coal-gas | 2,000 | 1,600 | 450-650 |

The high temperature of the oxy-acetylene flame is an advantage, as it allows higher working speeds and results in a narrower heat-affected zone than other flames. The oxy-hydrogen flame is extensively employed for aluminum alloys, however, and other fuel gases; such as butane, are also suitable. The gases

used, particularly low-pressure acetylene, should be free from impurities, which may cause unsatisfactory welds. Purifiers should be operated efficiently and cleaned regularly.

Type of Flame. The flame must contain the correct proportion of oxygen to fuel gas. For aluminum and aluminum-base alloys the flame must be adjusted to the neutral position and maintained there during welding.

Too much oxygen gives oxidizing conditions which increase the formation of alumina, while the reducing flame, i. e., containing excess fuel gas, tends to give porous welds. Hydrogen and other gases dissolve readily in the liquid metal, but are less soluble in the solid metal. Therefore they are rejected during the freezing of the weld, giving rise to gas pores.

In the oxy-acetylene flame, any excess acetylene may react with the molten aluminum to produce volumes of hydrogen and also an appreciable amount of carbon, which may be deposited in the weld metal or alongside the joint as soot. Further, molten aluminum reacts with the water vapor in the outer envelope of the flame, again giving hydrogen,

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WRITE

and hence porosity. Care should therefore be taken not to play the outer portion of the flame on the molten metal.

Adjusting the Flame. In a neutral flame the important inner bluish white cone is well defined with a rounded end, and the outer envelope varies in color from blue to orange, becoming almost colorless a few inches away from the inner cone.

In an oxidizing flame there is a shorter cone with a pointed tip, and the outer envelope is smaller and has a more bluish tinge than in the neutral flame.

In the reducing or excess acetylene flame there is a feathery white plume at the end of the inner cone, the length of the feather depending upon the amount of excess acetylene. The outer envelope is somewhat more luminous than that of other flames, and if the amount of acetylene is particularly high, the edges of the flame appear deep yellow and smoky. The flame is usually adjusted to the neutral position by starting with excess acetylene, and reducing it gradually until the feather on the inner cone just disappears.

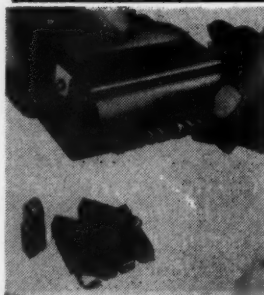
The oxy-hydrogen flame is neutral when it shows a well-defined bluish cone in the center of a fairly large flame. With an excess of oxygen the flame is considerably smaller and has a very short cone surrounded by a small colorless envelope. The re-

ducing flame is large and somewhat ragged without any well-defined cone at the center. Its color varies from light blue to reddish.

After a short time it usually becomes necessary to make slight adjustments to the flame. The aim must be to keep a constant flame of the correct type throughout the period of welding.

Size of Flame. In addition to maintaining a neutral flame, the pressure should be such that the flame is soft. A fierce flame tends to force molten metal along the unfused edges, and may also lead to an irregular and undercut weld. The exact pressure or size of nozzle required for a particular gauge of aluminum or other metal varies according to the size of the parts welded, speed and skill of the operator, and, to a small extent, on the composition of the alloy. The general principle is to keep the time of welding as short as possible, and it is therefore advisable to use as large a nozzle as practicable.

Unless the nozzle is kept clean and true to size, the flame becomes non-uniform and thus prevents regular heating of the metal. The nozzle must not be cleaned by using a steel wire, etc., owing to the risk of enlarging the orifice or otherwise damaging it. A piece of soft aluminum or copper wire is suitable, and it should be smaller in diameter than the orifice.



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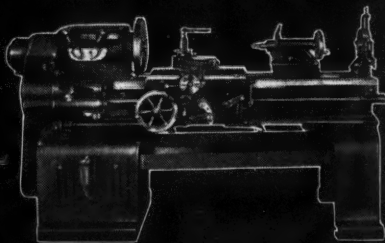
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Average Data for Oxy-gas Welding of Aluminum and its Alloys
Part A—Horizontal Welds Made from One Side by One Operator

| Thickness of Metal | ACETYLENE | | | HYDROGEN | |
|--------------------|----------------------|----------------------|-------------------------|----------------------|----------------------|
| | Diam. of orifice in. | Pressure lb./sq. in. | Consumption cu. ft./hr. | Diam. of orifice in. | Pressure lb./sq. in. |
| 0.020-0.025 | 0.025 | 1 | 1 | 0.035 | 1 |
| 0.027-0.040 | 0.035 | 1-2 | 1 | 0.045 | 1 |
| 0.042-0.064 | 0.055 | 2 | 1.5-2 | 0.065 | 1 |
| 0.067-0.1 | 0.065 | 3 | 2.5-4 | 0.075 | 1 |
| 0.125-0.190 | 0.075 | 4 | 5-0.8 | 0.095 | 2 |
| 0.25-0.30 | 0.085 | 5 | 7-12 | 0.105 | 2 |
| 0.32 | 0.085 | 5 | 12-20 | 0.115 | 2 |
| 0.375 | 0.095 | 6 | | 0.125 | 3 |
| 0.5 | 0.10 | 7 | | 0.140 | 6 |

Part B—Vertical Welds Made by Upwards Procedure

| Thickness of Metal | Single Operator from One Side | | | Two Operators, One Each Side | | |
|--------------------|-------------------------------|--------------------------------|-------------------------|------------------------------|--------------------------------|-------------------------|
| | Diam. of orifice in. | Acetylene pressure lb./sq. in. | Consumption cu. ft./hr. | Diam. of orifice in. | Acetylene pressure lb./sq. in. | Consumption cu. ft./hr. |
| 0.075-0.10 | 0.065 | 2-3 | 2.5-3.5 | | | |
| 0.105-0.125 | 0.075 | 3-3.5 | 4.5-5 | | | |
| 0.13 -0.15 | 0.075 | 3.5-4 | 5.5-7 | | | |
| 0.18 -0.22 | | | | 0.065 | 3 | 3.5-4 |
| 0.25 -0.30 | | | | 0.075 | 4 | 5-6.5 |
| 0.35 -0.42 | | | | 0.085 | 5 | 7-8 |
| 0.45 -0.6 | | | | 0.095 | 6 | 10-14 |
| 0.65 -0.80 | | | | 0.105 | 7 | 16-20 |

* Figures refer to each blowpipe.

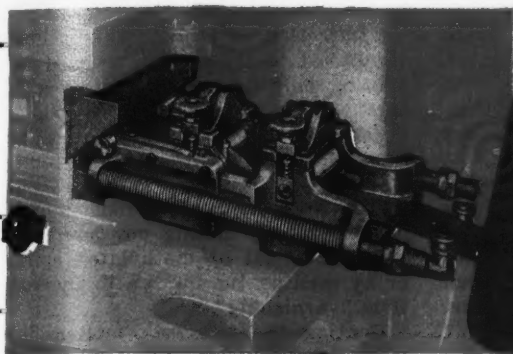
Note: In each case, the oxygen pressure is normally the same as the acetylene pressure, but in oxy-hydrogen welding it may be higher than the hydrogen pressure.

Flux. Unless the oxide coating is removed effectively, it is impossible to weld aluminum-base materials, and a flux is always necessary for this purpose. The composition of the flux requires to be altered according to the composition of the alloy. In particular, alloys containing more than about 2 per cent of magnesium are difficult to weld unless the flux is quite suitable.

A rapid test of the efficiency of a flux for a particular alloy can be made by applying a little to a piece of the metal and heating it with the flame. It should melt quickly without spluttering and spread freely over the metal to give a clean,

bright surface. Further heating should melt a small pool of metal, which should appear bright and free from any oxide film. As all normal fluxes pick up moisture from the air, they should be kept in sealed containers, and only sufficient should be taken out to complete the job. Exposure to the atmosphere results in loss of efficiency, and any flux paste unused at the end of the day should be discarded.

Suitable Types of Joint. Welded joints should be located where they allow easy access to each side of the weld, and the design of the welded assembly should include butt joints only. If lapped joints or fillets can-



The Dickerman Die Feed

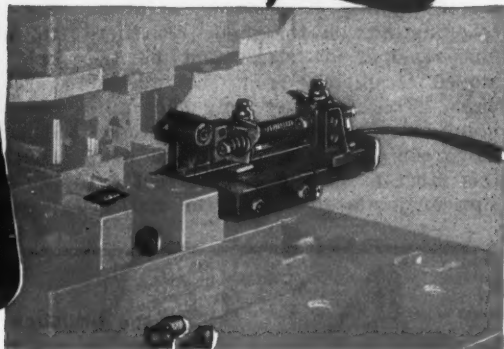
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not be avoided, the ends of such joints must be welded to seal them against moisture which might enter, to react with entrapped flux. If welds have to be used at corners, the corner should be radiused so that flux is not held in acute angles. It is especially important that cup-and-cone type joints should not be made in tubes, and that effective methods of washing tubular members when several joints are necessary, so that adequate washing and draining are possible.

Flux Residues. As mentioned, flux residues are liable to corrode the metal, making it essential to avoid trapping flux in the melt. Further, flux residues or slag must be removed completely from the finished weld. Therefore use only the minimum amount of flux necessary to remove the oxide effectively, and with this must be coupled the correct design of joints to reduce the risk of

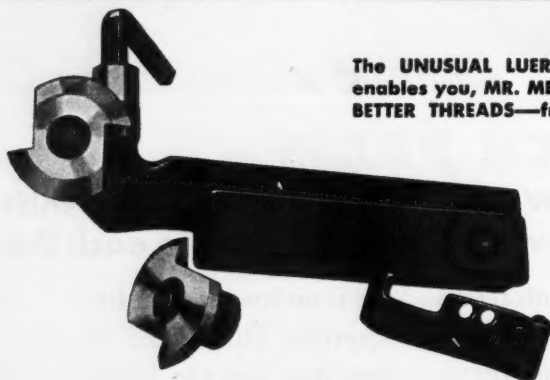
flux inclusions.

Application of Flux. Flux should be applied to the edges prepared for welding only by the following methods:

(1) The welding rods must be coated with a thin film of flux immediately before use. This is done either by dipping the rods into a paste made by mixing powdered flux with industrial or methylated spirit, or by melting the flux on to the rod, thus "varnishing" it.

Coating the rod with molten flux is preferred. For this the end of the rod is heated and dipped into the dry powder, allowing a tuft of flux to adhere to it. The rod is then held almost vertical with the powdered flux at the upper end, and rotated slowly so that as the flux melts it runs down to provide a uniform coating.

(2) A thin layer of the flux paste is painted on the edges of the work



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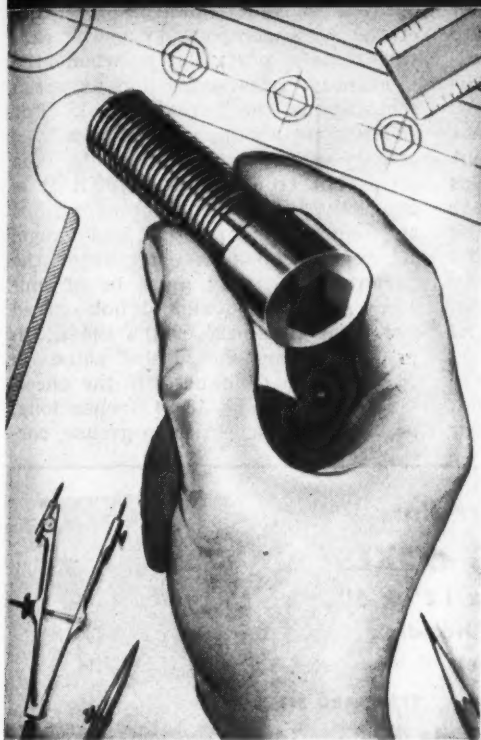
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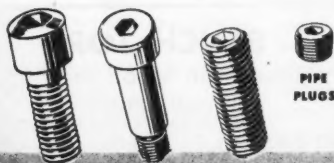


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before preheating. This film of flux melts and minimizes oxidation as the temperature increases. After preheating, a further thin film of paste may be applied to the hot metal before welding starts. Wherever a weld is accessible from both sides, flux should be applied on the under side as well as above, in order to ensure adequate fusion. This is always necessary when welding the alloys containing magnesium.

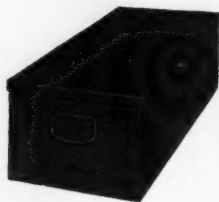
(3) During welding it should not be necessary to add extra flux, but in exceptional cases small particles of oxide may be noticed in or near the melt. Such particles are raised to incandescence by the flame, and it is sometimes suggested that they should be puddled out. Puddling, however, is not recommended, as it is more likely to result in entrapped oxide or slag, but it is permissible to add extra flux by means of the hot filler rod. A small quantity only

should be employed for this purpose and it should be allowed to "varnish the rod" before it is applied.

Welding Rods. Sometimes thin sheet is welded without additional filler metal, but generally it is necessary to use a welding rod, if only to apply flux. Filler metal is preferably of the same composition as the parent metal, particularly when the joint must resist corrosion as satisfactorily as the parent metal. For sheet up to about $\frac{1}{4}$ inch thick it is often possible to use as welding rods strips cut from the sheet, but it is generally preferred to employ wire of the required composition and gauge. If welding rods are cut from the parent metal, they must be of uniform section and should not exceed twice the thickness of the sheet. In general, they should be equal in width to the thickness of the sheet.

Rods should be 18-24 inches long, and should be clean from grease, cor-

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Filler Rod Data for Leftwards Welding of Aluminum

| Thickness of Metal | Diam. of Rod | Approx. Weight of Rod per 100 ft. | Average Weight of Rod used per 100 ft. run of Weld |
|--------------------|--------------|-----------------------------------|----------------------------------------------------|
| Up to 1/16 in. | 1/8 in. | 1.5 lb. | 4- 6 lb. |
| 3/32—1/8 in. | 1/8 in. | 1.5 lb. | 9-12 lb. |
| 5/32—1/4 in. | 3/8 in. | 3.5 lb. | 18-26 lb. |
| 9/32—3/8 in. | 3/8 in. | 3.5 lb. | 30-40 lb. |

rosion products, and so on. When strips sheared from the parent metal are used, particular attention should be paid to cleaning and to removal of burrs or dirt. Sufficient rods, already fluxed, should be available to complete a weld without allowing the metal to freeze. The flame should not be removed from the weld when the operator takes up a new rod.

Preparation for Welding

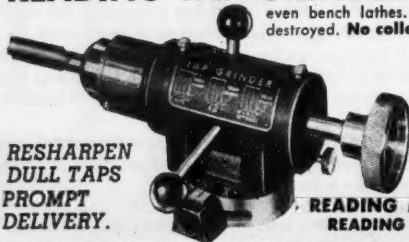
Beveling the Edges. For the thicker gauges of sheet and tube, some form of edge preparation is required. Whether beveling is required or not, edges must be uniform, as irregularities cause difficulties during welding and may result in defects such as inadequate penetration. Edges may be beveled by hand, but filing is not recommended. A hand-plane with metal base is satisfactory for flat sheets, while portable grinders or similar machines are useful for large plates, tubes, and so on. When sections of different thickness are to be welded, the edge of the heavier

section should be reduced gradually to about the same thickness as the lighter material.

Cleaning the Edges. The edges are coated with flux immediately before welding starts, but in order to reduce the time required for the flux to react, they should be thoroughly cleaned before applying flux paste.

Where thick grease is present, the material may require a preliminary washing in paraffin, which is followed by the normal cleaning method, either by means of a chemical solution or in a solvent degreaser, such as a trichlorethylene plant. Proprietary cleaners are satisfactory, or a 3-5 per cent solution of caustic soda, with a 1-3 per cent addition of sodium silicate to reduce attack on the aluminum, may be used. After chemical cleaning, wash well in hot water, followed by a rapid dip in 10 per cent nitric acid, and then rinse again. After degreasing, it may be necessary to scratch-brush the edges to remove excessive oxide or adhering films of soap, dirt or filings. Emery

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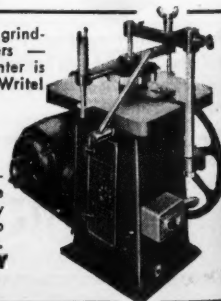
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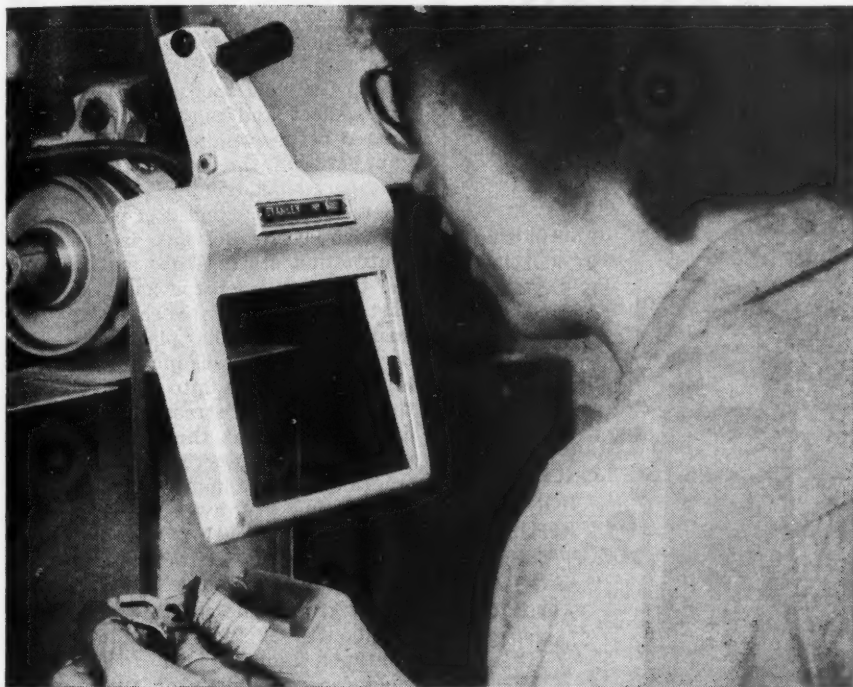
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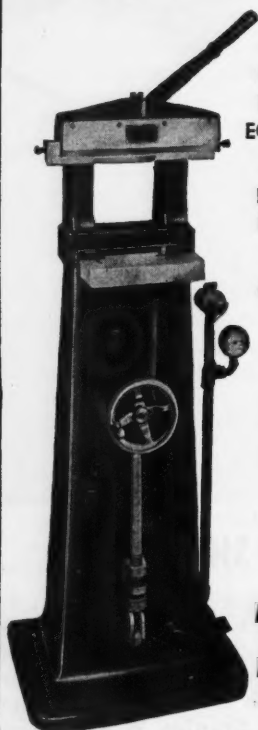
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cloth is not suitable for final cleaning because of the particles of abrasive.

Setting up the Work. The parts to be welded must be set up so that contraction stresses are kept to a minimum, to reduce risk of cracking within the weld zone. Whenever possible, sheet and plate should be arranged before welding with a tapered gap between the edges, the amount of taper depending on the length of the weld and the speed of welding.

When a parallel gap is used, the contraction stresses are sufficient by the time the operator has completed part of the weld to cause the opposite ends of the plates to come together. The edges may either overlap or be forced into close contact, thus setting up stresses which may cause a crack at the point of welding. With a tapered gap the contraction of the metal is responsible for gradually drawing together the plates, so that with a suitable degree of taper the gap at the point of welding remains constant.

The gap at the starting end should be about 1/32 inch, but the amount of taper required per foot run of weld depends chiefly on the speed of welding. Experience dictates that it should vary between 3/16 and 11/32 inch per foot run, according to the welding speed.

Jigs. Although taper spacing is recommended for straight seams, it is neither possible to the vertical upwards method nor for welds in complicated assemblies. A gap of suitable width may be maintained by means of wedges or grips or by mounting the components in a jig.

Tack Welds. When jigs or wedges cannot be used, the parts are often held in position with a parallel gap by means of tack welds spaced 1/4 inches apart, according to the thickness of the metal. Thin material requires more frequent tacking than thick, and the width of the gap may



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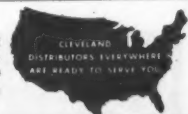
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vary from 1/32 to 1/4 inch according to the thickness. Tubes are tacked at intervals of 120 degrees or less. Sometimes tacking may be carried out on jigs from which the work is removed before the seam is welded.

Welding Technique

Preheating. Preheating made necessary by the rapid conduction of heat from the weld, must be carried out before the welding can begin. It is essential for all castings, and also for sheet, tubes and sections, except when the parts joined are very small or when the material is thinner than about 22 gauge (about 1/32 inch). Wrought metal is normally preheated by playing the blowpipe flame on and around the edges, but castings require general heating in a suitable furnace. The preheating temperature required varies from 300-350 deg. C., according to the size of the work. Large components require

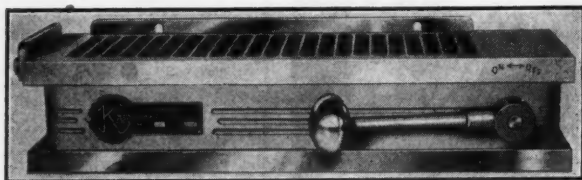
a higher temperature than small lightweight assemblies.

Temperature Measurements. Large, complicated castings should be preheated to about 400 deg. C., smaller castings between 300 and 350 deg. C., and simple castings of low weight to 250-300 deg. C.

There are several methods by which the temperature can be judged. A rough indication is given by rubbing the surface occasionally during heating with a piece of dry wood, which leaves a brownish black mark when the preheating temperature is correct. A little dry sawdust sprinkled on the metal begins to char at the usual preheating temperature. A better alternative is to mark the surface with a blue copying pencil, such marks turning white when the temperature is sufficiently high. Temperature-indicating paints permit more accurate measurement.

Castings require more accurate

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temperature control, and in the rare instances where castings are joined to wrought material it is advisable to preheat the casting in a suitable furnace with an accurate means of measuring its temperature. When sections of different thickness are to be welded, the heavier metal must be preheated to a greater extent, in order to avoid too rapid melting of the thinner material during welding. Slow cooling of such assemblies or of castings after welding is necessary to avoid the risk of cracking, particularly when the casting or the final assembly is complicated.

When joining horizontal plates, the blowpipe and the welding should be in line with the weld in order to avoid unequal heating of the two edges. The angle between the blowpipe and the plates should be about 45 deg., but this angle may be reduced progressively during welding to compensate for the gradual increase in

temperature of the parent metal.

At the start of a seam it may be necessary to hold the flame almost perpendicular to the work to concentrate the heat. The filler rod should be held at an angle of 30-40 deg. to the weld in all cases. The tip of the inner cone of the flame should be from $\frac{1}{16}$ to $\frac{1}{8}$ in. from the metal, and the flame should be advanced steadily without weaving during the course of the weld.

Tacking. When a job is tacked together, tacking is carried out immediately after preheating, care being necessary to avoid excessive melting during this operation. Filler rod is not always used, but a small quantity is generally necessary except for thin gauge material. The flame is held almost vertically to the surface and a smaller flame than that used for the actual welding operation is sufficient.

Tacks are spaced at intervals ac-



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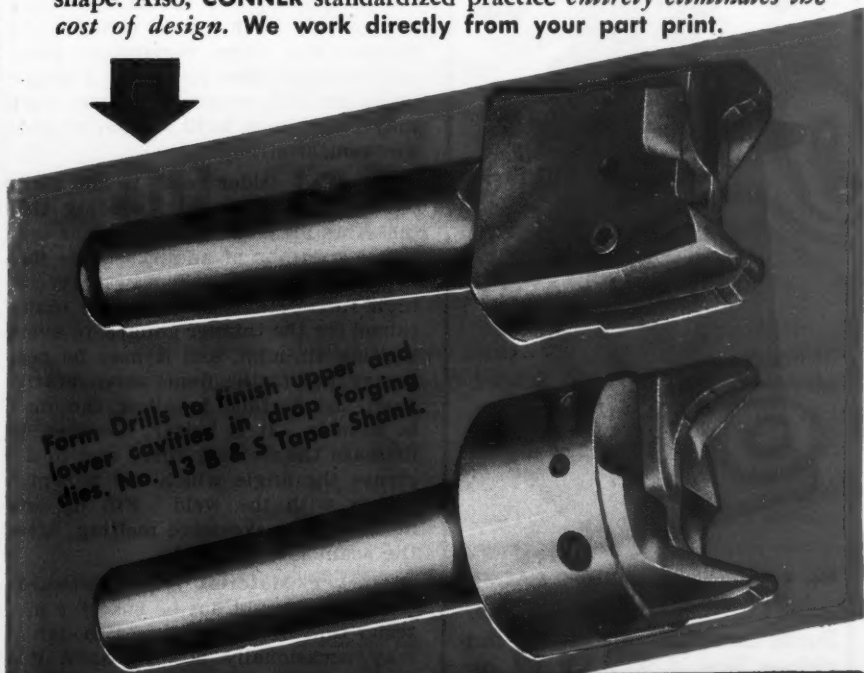
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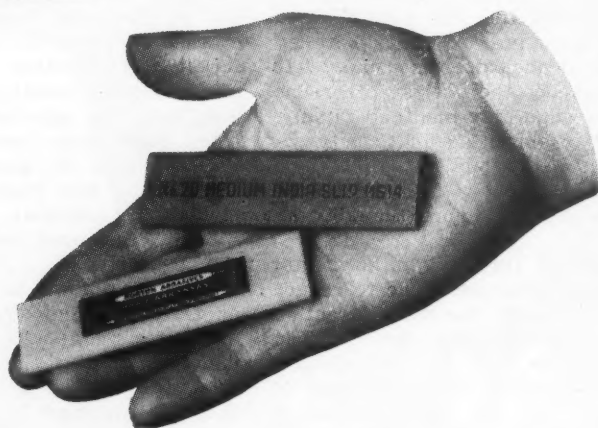
cording to the thickness of the material, general limits being 1-1½ inch for 16 gauge and thinner, and up to 4 inches for 10 gauge. Tacking of metal thicker than 10 gauge is not common practice in gas welding. Tacks should be small and the tacking operation should be carried out as rapidly as possible in order to reduce distortion. Distortion of the parent metal should be corrected before welding the seam, and tacks must be completely remelted during subsequent welding.

Thin Sheet. For sheets and tubes up to 3/32 inch thick (approx. 14 gauge), the edges require no preparation other than cleaning. Flanged edges are not recommended, as they may result in a weld section of poor mechanical strength.

A skilled welder needs to add little, if any, filler rod when welding thin material, although a thin wire is useful as a means of adding a little flux from time to time if necessary. A high rate of welding must be maintained for the thinner gauges, to avoid melting through, and it may be necessary to lift the flame momentarily from the surface to allow the melt to solidify. It is better, however, to increase the welding speed and to decrease the angle which the blowpipe makes with the weld. Fill up any holes, due to excessive melting, after the seam is completed.

Thicker Material. The leftwards procedure should not be used for material thicker than ¼ in., although it may occasionally be necessary, due to the design of the article, to use this technique for material up to ½ inch thick. The vertical upward method is preferable for sheets thicker than ½ inch, again subject to the design being suitable. Edges of material from 3/32-¼ inch thick must be bevelled. The included vee angle recommended is 45-75 deg. A

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less skilled operator may require angles up to 90 deg., although this results in a greater consumption of both filler rod and gas, with a lower rate of welding. A small bevelled lip about $\frac{1}{8}$ inch deep is usually left at the base of the vee, as otherwise the lower edge may melt too rapidly. In order to obtain adequate penetration with metal thicker than $\frac{1}{4}$ inch it may be necessary to increase the included angle to more than 90 degrees.

Procedure. On straight horizontal seams it is often advisable to reduce risk of cracking due to contraction stresses, by starting the weld a short distance from one end, usually about one-quarter the total length of the seam, and the longer portion of the weld is made first. The assembly is then turned round or the operator welds from the other side, and the shorter length is completed starting from the same point.

Inadequate fusion results in a serious loss of strength across the weld, and may increase the risk of cracking in the weld metal. Therefore, particular care must be taken to ensure that both edges are molten before any filled metal is added. Flux lodged in the gap between the unfused edges may lead to corrosion. Welds should be made in one run only, but if two runs are necessary for thick material, flux residues should be removed before the second run is started.

What is known as the step-back or terrace technique is particularly useful for metal which tends to give undercutting at the edges of the weld, but can be used only for material thicker than about $\frac{1}{4}$ inch. About an inch of the edges of the parent metal is melted and a very small amount of filler rod added to half fill the vee between the edges. The flame is then moved back to the beginning and a

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second layer is deposited before the flux or the weld metal has solidified completely. This is followed immediately by the fusion of the next inch, and the procedure is repeated.

Tubes. The leftwards technique is used for circumferential welds in tubes. It is essential for small diameter tubes and preferable for all sizes, to arrange for the tube to be rotated slowly in the clockwise direction during welding, at such a speed that the welder can always work on the top of the tube. It is particularly important that penetration be complete without excessive melting through, as it is generally impossible to make good any defects inside the tube. Longitudinal joints in tubular assemblies are made by the normal leftwards technique.

When necessary to weld a tube to a flange, the hole in the flange must be bevelled so that when the tube is

inserted, a vee gap of right size is formed. When possible such welds should be made with the flange horizontal, and if the gap is on the outside of the flange the weld can be machined level if required. As a flange is usually thicker than the tube to which it is joined, the flange should be preheated more than the tube end.

Sometimes it is necessary to weld a T-joint between two tubes, and if the diameters are suitable a flange should be worked from the hole in the main tube so that the branch can be joined by means of a butt weld. If the bore of the tube is too small for this to be done, a hole of the required diameter is cut in the main tube and the end of the branch shaped to fit. In such cases great care must be taken to obtain complete fusion inside the tube and to avoid flux inclusions.

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Vertical Welding. For this sheets are held vertically and the weld is started at the bottom. Welding is carried out either from both sides by two operators, or from one side. In the single-operator method, the angle which the blowpipe makes with the vertical plate is varied slightly according to the thickness. This variation is from approximately 55 deg. for $\frac{1}{8}$ inch plate to almost 90 deg. for $\frac{1}{4}$ inch plate. If material less than $\frac{1}{4}$ inch thick is welded, a greater reduction in the angle is required to avoid excessive melting.

When the weld is accessible from both sides, the vertical upwards two-operator technique is recommended, and in this case no variation in the angles of the blowpipes or filler rods is required. It is essential, however, that the operators should have considerable experience in working together, and their welding speeds should be exactly the same, otherwise molten metal is blown through the gap between the plates. This entails identical welding flames and accurate maintenance of welding angles.

In each case the weld is started by melting a hole at the base and adding filler rod to the melt. Generally the end of the filler rod is held just below the surface of the molten pool, and a little flux is added by means of the rod as required. Thus there should be no difficulty in obtaining complete penetration, even with plates $\frac{3}{4}$ to 1 inch thick.

Principal advantages of the vertical methods are reduction in the preparation of edges and in the amount of filler rod used, coupled with an increase in welding speed. In the two-operator technique less heat is required, hence gas consumption is low and there is a reduction in the amount of contraction for which allowance has to be made.

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Finishing

Washing. Owing to the corrosive nature of the fluxes used, all residues must be removed completely immediately after the weld is finished. These residues dissolve readily in hot water, but in order to remove all traces, particularly from irregular welds, it is advisable to scrub the seam vigorously. Water should be as hot as possible, preferably boiling, and several short washings are better than one immersion. When it is difficult to immerse welded assemblies, such as large fuel tanks, in water, a stream of hot water must be directed inside, particularly on to the weld, and must be supplemented by scrubbing. Where flux is likely to be entrapped, or for treating inside tubes and similar assemblies, chemical treatment after this washing is advisable. Such treatment must always be followed by further washing, and

in each case final rinsing should be in warm running water, preferably at 80-95 deg C., for not longer than three minutes, to avoid staining.

Chemical Treatment. The one recommended is immersion in a 5 per cent solution of nitric acid maintained at 60-80 deg. C. for about 10 minutes. It is sometimes recommended that sulphuric acid should be used, but this may result in some corrosion of the weld. Likewise the addition of hydrofluoric acid to the nitric acid bath is not recommended.

After immersion in the nitric acid, washing must be thorough and the efficiency of the final washing operation should be checked by adding a small quantity of a silver nitrate test solution to a sample of the wash water, or to washings from the joint. If a white precipitate appears it indicates that flux residues are still present and the cleaning operation

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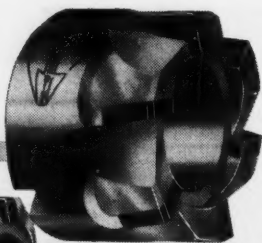
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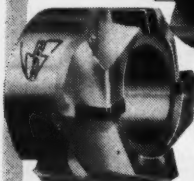
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should be repeated.

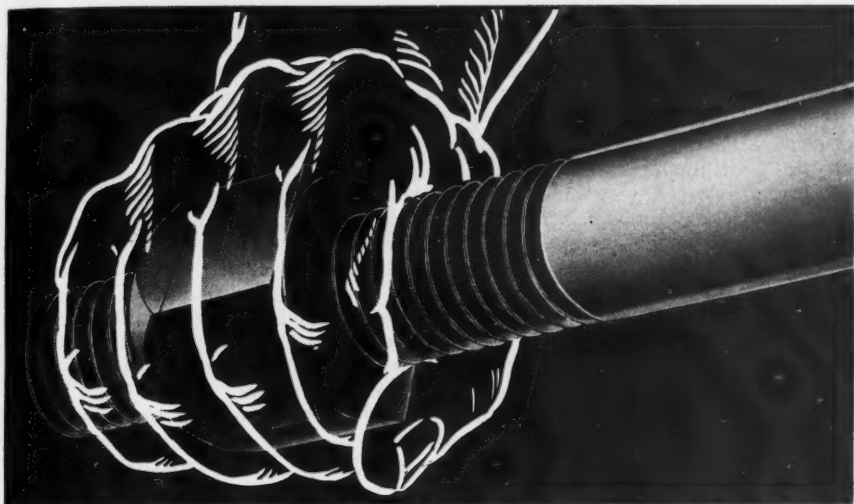
This test solution contains approximately 2 per cent silver nitrate, to which must be added a small quantity of nitric acid. Certain water may contain traces of substances capable of causing a slight precipitate or cloudiness, and in such cases it is recommended that a separate test on a sample of the tap-water should be carried out and washing should be continued until the final rinse shows no more cloudiness than the blank test on the water supply.

It must be stressed that nitric acid treatment does not replace effective washing in hot water, combined with vigorous brushing of the weld. Further chemical treatment is not required except in complicated jobs where scrubbing is impossible. After washing is complete, care must be taken to drain the assembly and dry it as quickly as possible.

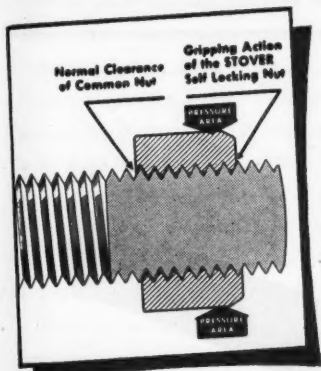
Working. It is generally beneficial to work the weld metal, by hammering or other means, in order to break up the cast structure and to assist in releasing any internal stresses which may be present. Cold working is usual, although hot working at temperatures from 300-450 deg. C. may be possible in certain applications. The extent of either hot or cold working depends partly on the alloy involved and on the amount of spreading of the metal due to reduction in thickness.

In general, the heat-treated alloys work-harden to a greater extent than the non-heat-treatable alloys, and there is a greater risk of heat-treated alloys cracking during working. Careful hammering of welds in heat-treated alloys at 350 to 450 deg. C. is sometimes possible, but the assembling must be reheat-treated afterwards to restore the mechanical properties as much as possible.

Flux removal must be complete before the weld is hammered, and it



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may be necessary to chip or grind the upper or lower surfaces before working. Care must be taken to brush off any particles of other metals or abrasives which might otherwise be forced into the surface of the joint during working.

Although working is usually carried out by hammering, wheeling is also used for sheet assemblies. The working must be sufficiently heavy to affect the weld metal throughout the cross-section, and light or irregular working should be avoided.

Working is usually carried out with the flat face of a hammer or mallet, but skilled workers sometimes start with the ball end. The lower side of the weld must be supported rigidly during hammering. With work-hardened alloys in the half-hard condition, hammering or wheeling restores to some extent the strength

lost due to the annealing effect of the welding flame. In practice it is not possible to restore, by any form of working, the reduction in mechanical properties of the parent metal due to welding.

Heat-treatment. Non-heat-treated material is often annealed after welding and cold working in order to increase its ductility. This may be carried out either locally by means of the blowpipe flame or by heating the complete assembly in a suitable furnace. The annealing temperature is from 300-350 deg. C. for the strain-hardened alloys.

Welded assemblies in heat-treated alloys after the weld has been worked should be reheat-treated in accordance with the appropriate temperatures. This does not result, however, in the same level of strength as is obtained in unwelded wrought material.



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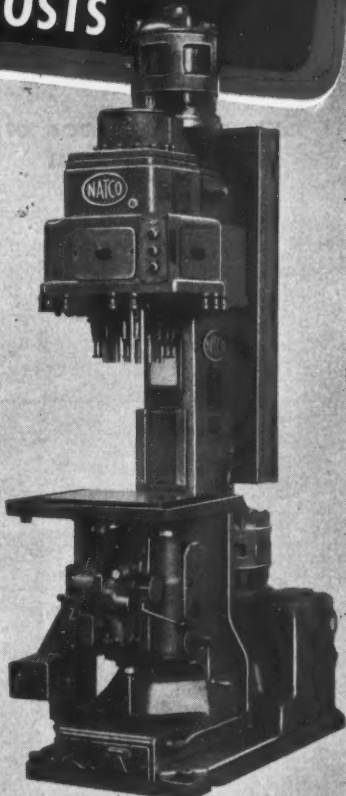
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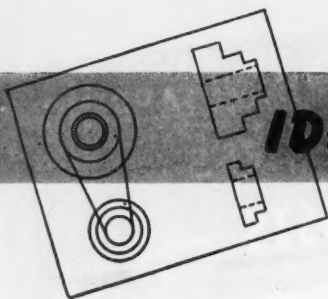


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NATCO Model G5 is particularly adapted for high-speed sensitive drilling and tapping of small holes.



IDEAS FROM READERS

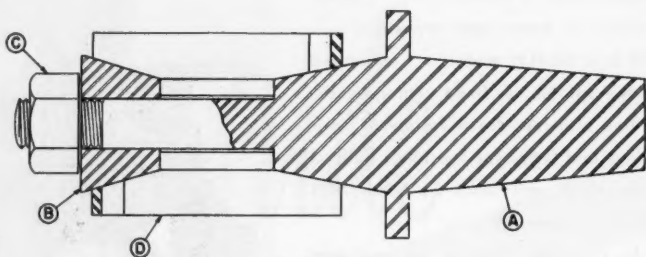
Expansion Arbor of Simple Design

By MICHAEL AXLER

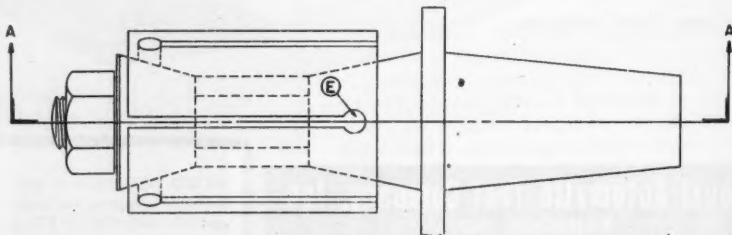
THE article describing a simple expansion arbor, on page 186 of the August issue of MODERN MACHINE SHOP, reminds me that we are using an expansion arbor which I believe is much simpler to make and operate. A

drawing of the arbor is enclosed herewith.

From one end of the body A projects a stud that is threaded on the end to take the nut C. The arbor body is tapered, as is also the plug B, to fit a corresponding taper in the ends of the expansion shell D. The expansion shell has four slots, two extending from each end for very nearly the length of the shell and evenly spaced



SECTION A-A



Expansion Arbor of Simple Design

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around the periphery, so that when the nut is threaded on and the tapered plug is forced into the end of the shell, the shell can expand.

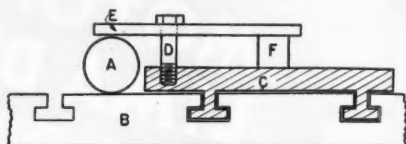
With a number of shells of different diameters, this arbor will take care of a large range of work. The shells are accurate in alignment to 0.001 inch, and can easily be trued up, when worn, by turning or grinding.

Clamping Small Work On a Large Table

(Courtesy General Electric Company)

AN efficient means for securely clamping material of smaller diameter than the space between the T-slots of the large milling machine that is to be used for the job has been devised and put into use at General Electric's Schenectady Works.

As shown in the drawing, the device consists of a steel plate, **C** which is machined with two T-shaped projections that fit into the grooves of the milling machine table. A hole is

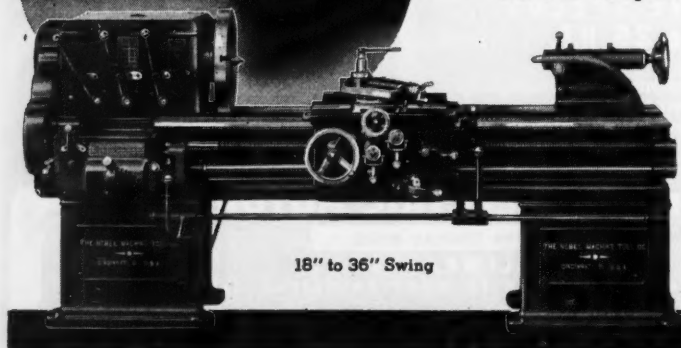


Device for Holding Small Work on a Large Milling Machine Table

drilled and tapped near one end of the plate to receive the stud bolt **D**. A steel strap **E** and block **F** complete the equipment. The steel strap is drilled to take the stud **D**.

By tightening the stud down on the steel strap **E** and thus on block **E** and the workpiece **A**, the work is held firmly for machining.

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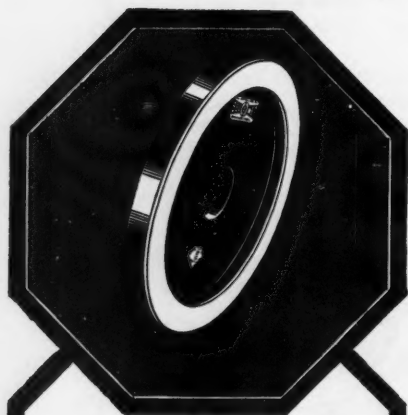
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Perfect Alignment in Welded Tube Joint

(This article was the winner of an award in Hobart Brothers Company Arc Welding News Contest.)

THE Meredith Welding Company, Los Angeles, California, is frequently called upon by the various aircraft companies on the Pacific

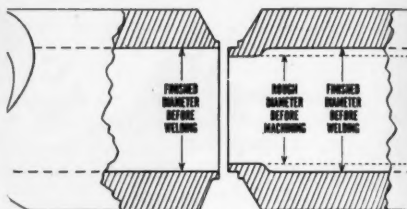


Fig. 1—Drawing Showing Preparation of Joint in Tubing Sections Before Welding

Coast to handle the welding of intricate welded assemblies and welded joints, one of which is illustrated herewith. In this case two sections of tubing were to be welded together, during which perfect alignment was required to be maintained.

The tubing had an unusually thick



Fig. 2—Tubing Joined and Ready for Welding

wall, as shown, and the section was to be machined both inside and out, both before and after welding. The male seat of the joint is removed in the final machining operation.

To maintain alignment, Russell Meredith designed the joint shown in the illustrations. The preparation of the joint consisted in machining mat-

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December, 1944

MODERN MACHINE SHOP

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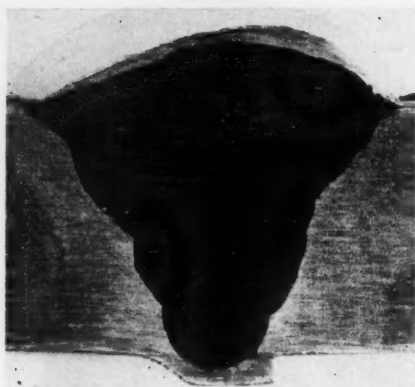


Fig. 3—Enlarged Photograph of Longitudinal Cut Through Welded Joint

ing seats, the male seat acting as a backing-up plate on the inside wall so as to allow 100 per cent penetration without leaving "icicles." The drawing Fig. 1 shows the machining preparations, and Fig. 2 shows the tube

joined and ready for welding. Figure 3 is an enlarged photograph of a longitudinal cut through the welded joint, and shows the complete penetration.

Mr. Meredith emphasizes that many parts heretofore thought impossible of welding can be welded together if the joint is properly prepared.

(Drawing and Photos Courtesy Hobart Brothers Company, Troy, Ohio)

Swinging Arm for Portable Hand Shear

(Courtesy General Electric Company)

IN order to simplify the task of cutting complicated designs from sheet metal stock of a minimum thickness of 7/64 inch, for which a portable power hand shear is used, the swinging arm holding fixture shown in the illustration was designed by E. A.

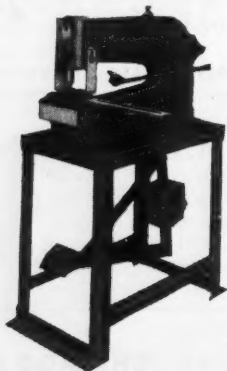
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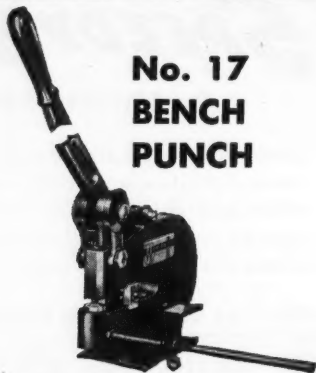
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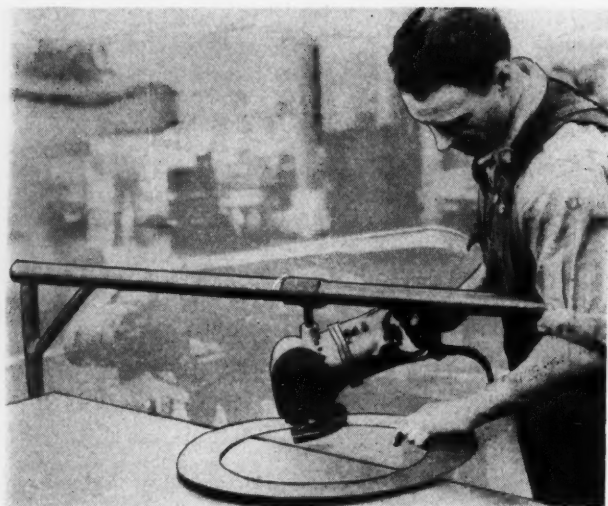


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Swinging arm of Welded Tube Construction Simplifies Task of Cutting with Portable Power Shear



Forss. Mr. Forss is a tinsmith at the Fitchburg plant of the General Electric Company.

Previous to the development of this

holding fixture, it was necessary to hold the work and operate the shear at the same time — which was a rather awkward task. Built of steel tubing, welded as shown, the fixture serves to hold the shear at the most convenient level above the workpiece. The vertical section of the fixture is anchored at the end of the bench in such manner that the arm can be swung as required to bring the shear into working position. The arm carries the



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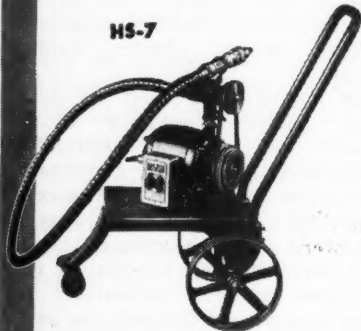
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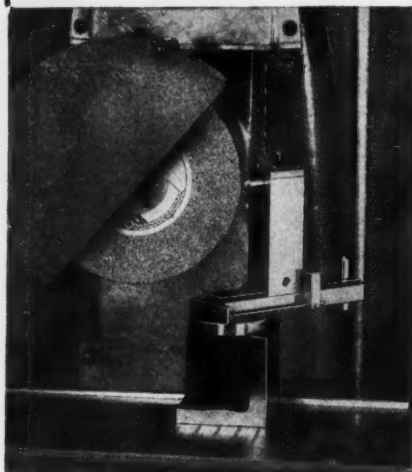
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weight of the tool; thus the operator can hold the workpiece with one hand and guide the shear with the other, giving him better control of both the work and the tool when cutting complicated designs.

Alternating-Current Arc Welder Used to Demag- netize Tools

INGENUITY has often led to the use of G-E arc welders to solve problems other than in the fabrication of metals. Among these have been the use of d-c equipments in thawing out pipes and in warming up airplane engines on cold mornings. Now comes the use of General Electric a-c arc welding transformers, equipped with stepless control, to demagnetize steel parts by a method similar to that employed by jewelers in demagnetizing watches, reports R. F. Wyer, General Electric welding engineer.

This method was used by E. L. Bailey, electrical engineer at the Chrysler tank plant in Detroit, to remedy trouble caused by metal parts clinging to dies which had become magnetized. Five or six turns of cable were wrapped around the die and a heavy 60-cycle alternating current from a G-E 500-ampere a-c welder was passed through the cable, the current then being gradually decreased by turning the current-control crank on the welder. This procedure is now regularly employed in the Chrysler plant.

The widely expanded use of highly hardenable alloy steels since the war began has brought to light numerous instances where permanent magnetism has caused trouble in arc welding, as well as in the operation of various kinds of tools.

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News of the Industry

Patterson Predicts Skilled Labor Shortage

Unless sufficient new young blood is syphoned into the machine tool industry through apprentice training, its skilled worker force is destined to a serious depletion. This was the prediction of William F. Patterson, Director Apprentice-Training Service, War Manpower Commission, in an address before the American Society of Tool Engineers, at its recent semi-annual meeting in Syracuse, New York.

Mr. Patterson's prediction was based on statistical evidence of the increase in the average age of craftsmen in this industry, and the comparatively small number of youthful workers who have been trained to replenish and rejuvenate their ranks.

"The median age of skilled men in the machine trades in 1940," he said, "was 39.1 years. In 1930, it was 34.6 years. This shift in a decade strongly suggests that we are not training a sufficient number of craftsmen to maintain a satisfactory balance as to age and quantity.

"Our statistical studies show that in many trades, including machine trades, our craftsmen have been aging rapidly. Time, aided and abetted by long hours, of work and war anxiety, is taking a heavy toll. We are coming to a period where a high degree of skill is essential, not only to its possessor, but to the establishment in which he works. Never in the history of our nation has there been the need for training of industrial craftsmen that exists today."

Mr. Patterson explained that the size of the training job ahead was due largely to the shortage, during the war, of young men on the home front who qualify for apprenticeship. This shortage, he pointed out, has opened up great opportunities for returning veterans. To enable ex-service men to have the advantage of apprentice training, and equip them for an industrial career, he said that employers and labor in many of the major industries had amended the eligibility requirements for

this training, including age qualifications. To permit veterans who are beyond the customary age limitations for apprenticeship to have the benefits of this training, the number of years they have served in the military forces is not counted, Mr. Patterson said.

In order to answer some of the dollars-and-cents questions of management and particularly training directors, he said that Apprentice-Training Service had recently issued a pamphlet entitled "Evaluating Apprentices," which endeavors to set forth elements to be taken into consideration in determining what dollar value the apprentice returns to his employer, as against the wages paid and the various elements which may fairly be charged against him.

Economist Predicts Huge Market Following War

"The fact that some 6,600,000 couples have married during the past four years and for one reason or another have not become fully established, plus the fact that a need for new household equipment of various types has been building up while our factories have been making war goods means an optimistic outlook for business" according to statements made by John M. Byrne, economist, before the recent postwar planning conference of the Formica Insulation Company.

Among the postwar demands Byrne listed 3,500,000 new vacuum cleaners, 7,200,000 new clocks, 23,000,000 radios, 5,200,000 refrigerators, 3,100,000 washing machines, 3,700,000 percolators, and 4,500,000 electric toasters.

Reviewing the population growth coupled with "family-steads" Byrne reported that by the end of 1945 it is estimated that there will be 800,000 more families in the United States than if World War II had not occurred. "Based on 1942 Department of Commerce statistics," he said, "it is predicted that 1,300,000 new family dwellings will be needed annually for at least seven years."



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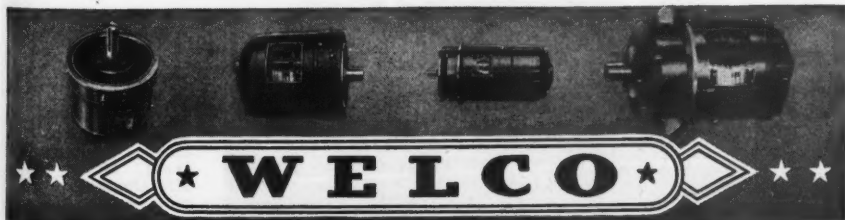
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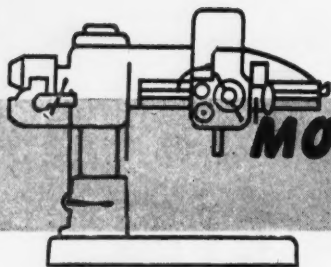
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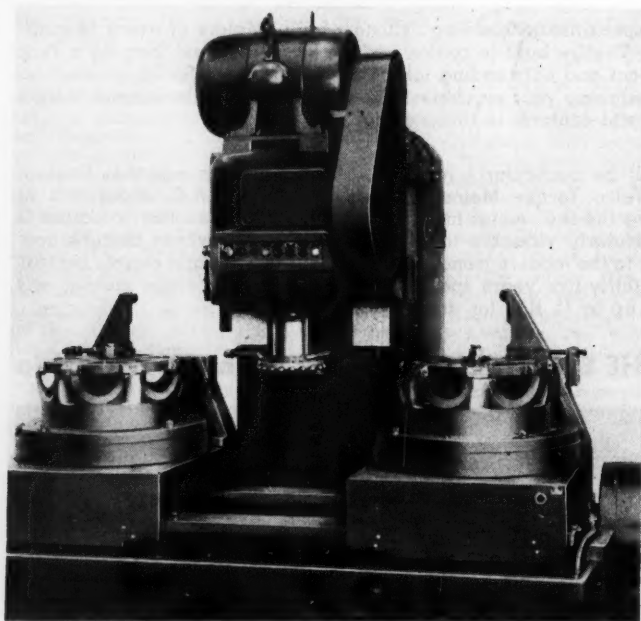
MODERN EQUIPMENT AT WORK

Interesting Method of Milling Contours

POSSIBILITIES inherent in the idea of feeding both milling cutters and work offer a wide field of study, and occasionally a machine is designed and put into use which incorporates an arrangement of this kind. A highly interesting instance is a special milling machine that was developed for use in one of the plants of the General Motors Corporation.

It is used for milling seven contours, equally spaced, around the circumference of an aircraft engine crankcase. An interesting feature of the machine is that two cuts are made at once, one cut in each of two crankcases.

Examination of the two photos and the drawing will reveal that the machine is built with two work tables, designed to slide toward one another at an equal feeding rate, or apart in like manner. Atop the sliding tables are rotating tables which carry the crankcases, and which are provided with automatic indexing facilities in which a geneva mechanism is incorporated. The heavy spindle carrying the milling cutter is equipped with vertical feed, as indicated in the drawing, and the arrangement is



Machine Developed by Cross Gear & Machine Company, Detroit, Michigan, to Mill Contours in Aircraft Engine Crankcases



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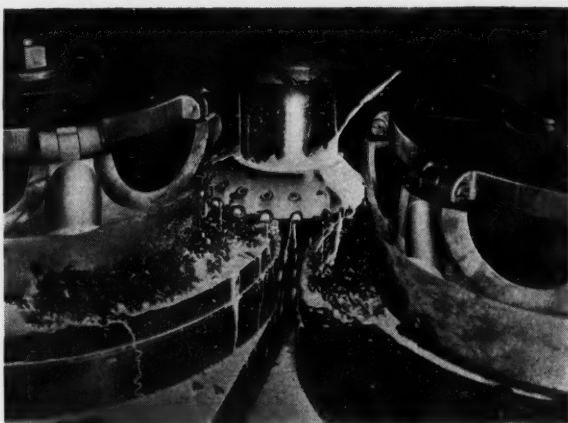
1944

December, 1944

MODERN MACHINE SHOP 235

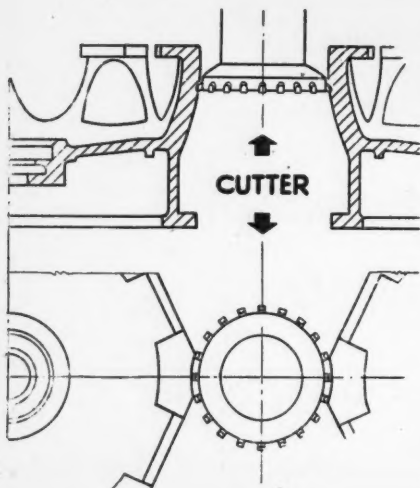
such that the downward feed of the cutter is positively synchronized with the inward feed of both tables to produce a formed contour.

The entire operating cycle is automatic and



(Right) — Close-Up Showing Contour-Milling Operation in Process

(Below) — Drawing Illustrating Relation of Cutter to Work in Contour-Milling Operation

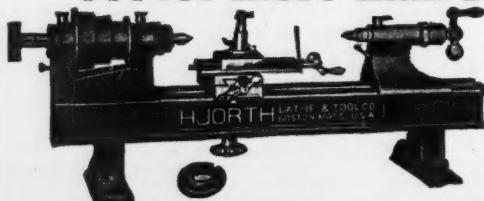


is controlled from a centralized push-button station. The cycle includes automatic stopping in the loading position, with hydraulic feed and rapid traverse for the cutter spindle and both tables. A short plug is used to locate and lock the indexing rotary tables during the cutting operation. It is interesting to note that eight machines of this kind, with two operators, replaced 39 operators and 37 standard machines.

Composite Hob May Solve Marine Gear Bottleneck

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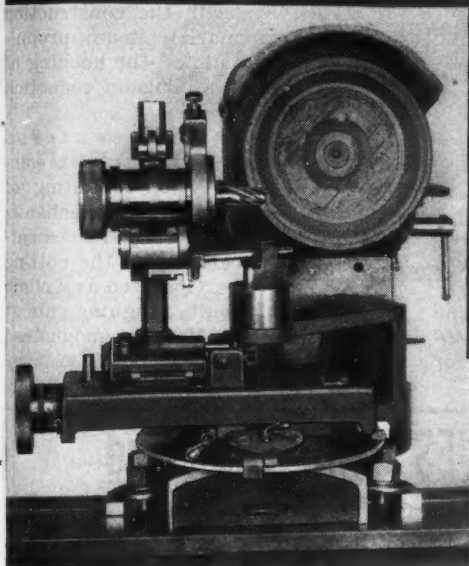
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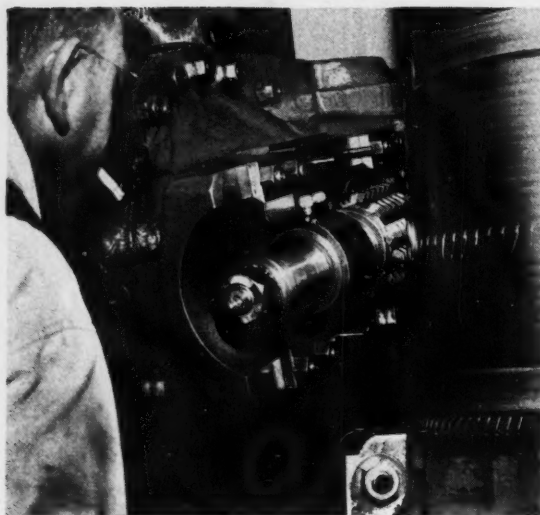
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The tests centered around the use of a composite hob, consisting of a hob body and mechanically-held strips of cemented carbide for the cutting edges. Operated as a climb

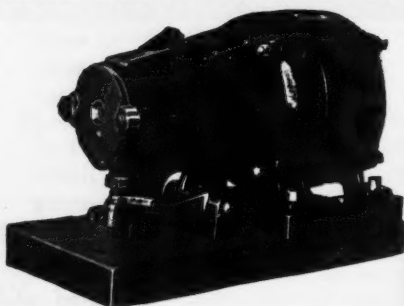
made in the Joshua Hendy turbine Shop, at Sunnyvale, California, a solution may be provided for one of

hob, the tool permits roughing cuts at spindle speeds of 100 r. p. m. instead of the previous speed of 35 r. p. m.

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Illustrating Model 2ELS4 on the job.

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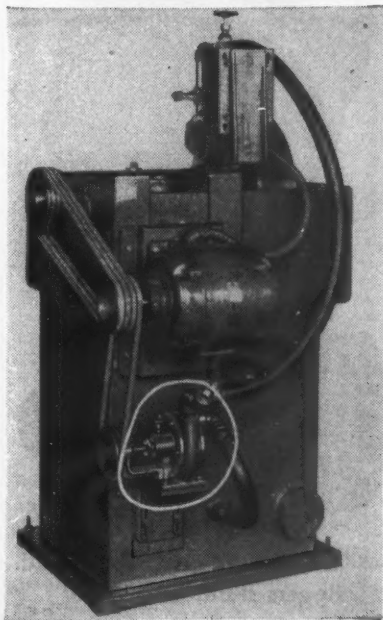
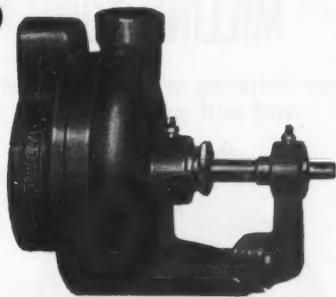
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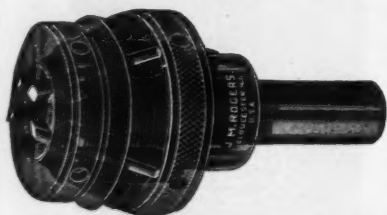


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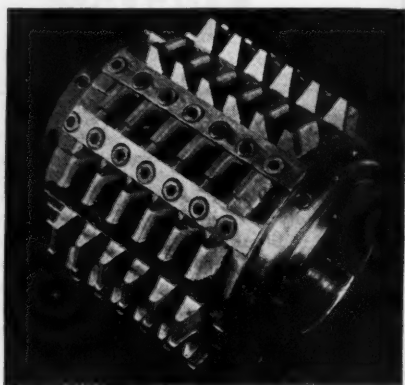


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The tests indicated, however, that changes in the design of the hobbing machine might make possible even faster operation, with the hob performing satisfactorily at speeds of perhaps 150 r. p. m. (225 feet peripheral speed). With the 72-inch machine used, 100 r. p. m. was the maximum possible speed.

The hobs used for the test are 6 inches in diameter, with a 2½-inch bore; 5 pitch, single-thread with strip



Close-up of the New Composite Five-Pitch, Single-Thread Hob with Strip Teeth Tipped with Cemented Carbide. The Hob has 11 Rows of 6 Teeth Each and is 6 Inches Diameter with 2½ Inch Bore. It is Designed for Climb Hobbing and is Capable of Operation at Much Higher Speeds than the Standard Hobs Previously Used

teeth, the left-hand hob having teeth tipped with cemented carbide (Kenametal K 4-H) and the right-hand hob having teeth of 12-4-2 high speed steel.

In preparation for the experiments, Gould & Eberhardt engineers visited the turbine plant to check adjustment of the 72-inch hobbing machine which was to be used. Hendy engineers checked both hobs for lead and form. Low-carbon pinion blanks were prepared and mounted on the machine, for initial tests were to be made on softer metal.

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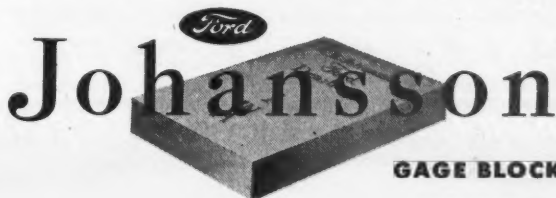
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ments previously in force, worn sets of Johansson Gage Blocks may now be returned to the factory, on an exchange basis, for new chrome-plated sets. This economical salvage service applies, of course, only to Johansson Gage Blocks, any of which (down to size 0.050") can be surfaced accurately with chrome plating. Write for new Price Schedule. D.M.M.

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GAGE BLOCKS

In starting the experiments, the right-hand hob was first used on the 72-inch machine with the prepared blank, feed up, rotation down, climb hobbing at normal 35 r. p. m. and 0.045 inch feed. Then the left-hand hob with carbide tips was adjusted and tested at speeds up to 100 r. p. m. with 0.045 inch feed, also climb hobbing. This completed, the operations were repeated on the blank regularly used for the pinions of 8,500 h. p. C-3 marine turbines. Complete performance records were made by the Bureau of Ships representatives, with the help of Hendy and Gould & Eberhardt engineers.

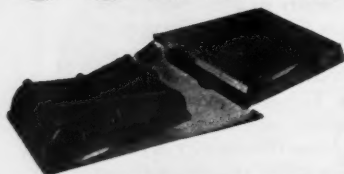
At the completion of a C-3 pinion, the carbide-tipped hob was removed for examination and found to be in much better condition than standard hobs are at the end of the same operation. The operation left a fine finish on the gear, and close inspection revealed exceptionally accurate helix

angles, which the Navy engineers attributed to a combination of the clean cutting action of the carbide with climb hobbing.

One of the advantages of the composite hob over the conventional solid one is that in the event a tooth is broken or damaged, the tooth strip alone may be removed and replaced instead of discarding the whole hob. In addition, heat treating and hardening techniques are applicable with more control and accuracy to individual tooth strips than to an entire hob.

If further study of the findings indicates that cemented carbide is suitable as a cutting medium for this purpose, the time needed for the cutting of marine gears may be reduced by 66 per cent or more, and the way may be prepared for further innovations which will increase the efficiency of hobbing operations and lead to other important developments in the gear field.

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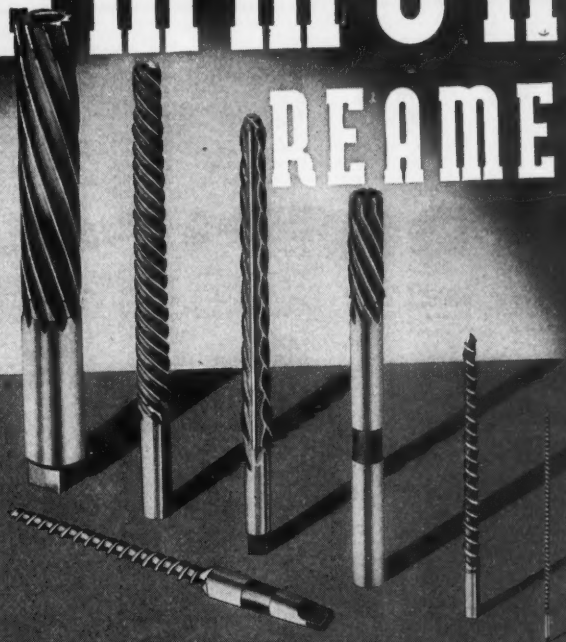
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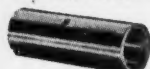
Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.



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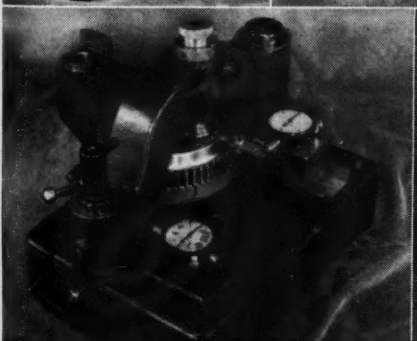
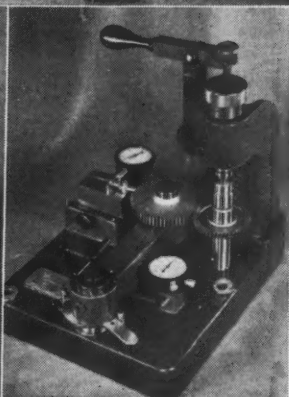
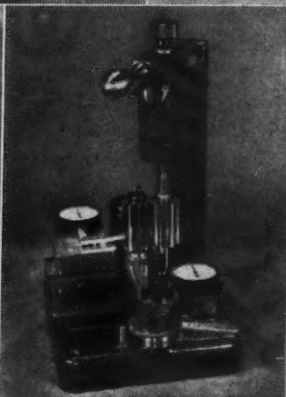
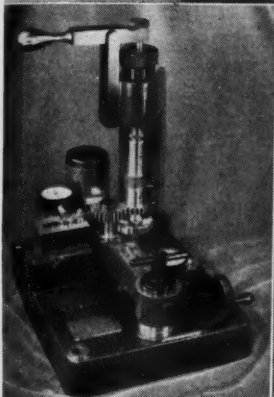
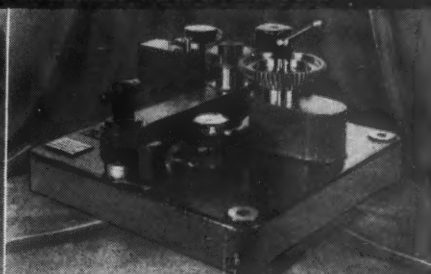
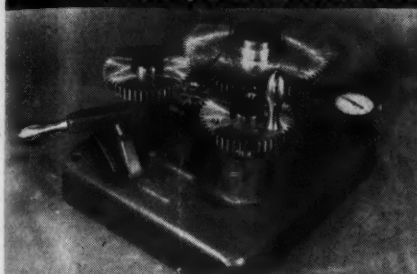
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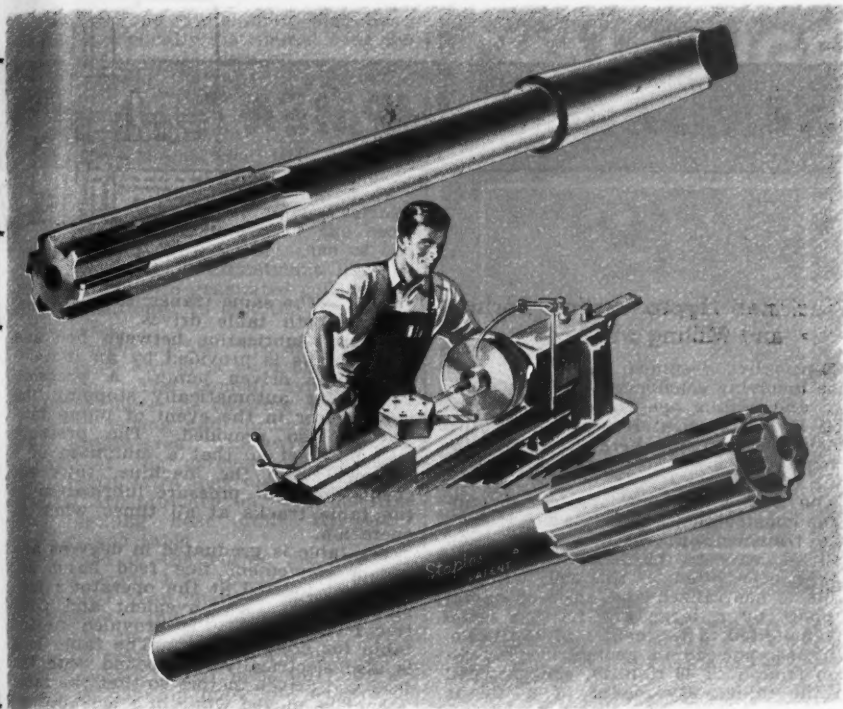
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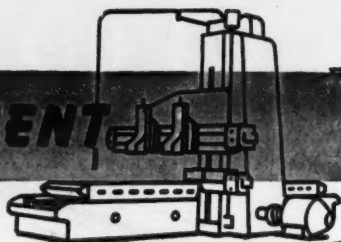
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NEW SHOP EQUIPMENT



Cincinnati Hypro Vertical Boring and Milling Machine

Especially designed for production jobs involving considerable boring, turning, and milling operations, the Cincinnati Hypro Vertical Boring and Milling Machine illustrated herewith has been brought out by The Cincinnati Planer Co., Cincinnati 9, Ohio.

The bed of the machine is of one-piece construction and is heavily ribbed. The transmission is fully anti-friction and all gears are hardened. Flat table tracks are bolted to the bed, and the table is centralized and afforded radial support by a large anti-friction bearing mounted in the center of the table.

Sixteen speeds in geometric progression from 1 to 30 r. p. m. are provided to the table. By means of a unique design, a low horsepower motor drives through a worm drive box, providing milling feeds from 2 to 80 inches per

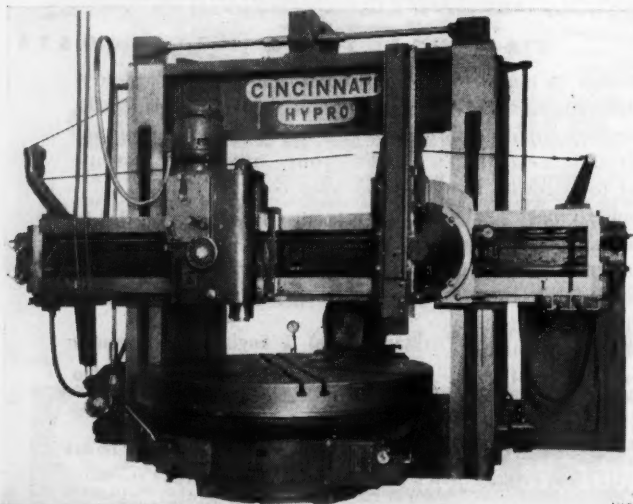
minute. The same transmission is utilized in both table drives.

Filtered lubrication between bed and table tracks is provided by an individual motor driven pump. A pressure switch for automatically stopping the main motor in the event of pump failure is also provided. The pressure switch is set so that a minimum of 3 lbs. will stop the machine, thus ensuring constant pressure lubrication to the table tracks at all times when in operation.

The table is graduated in degrees and has a convenient fine feed hand adjustment located at the operator's normal position. A convenient and positive locking device is provided to the table for cross milling. The table lock is also electrically interlocked with the feed and driven motors so that the table cannot be moved while in a locked position.

Pyramid type housings are used, the housings being of box construction and well ribbed. This type housing also provides a sheath for the individual ram counterweights.

The right-hand housing is also arranged for a side head and has a heavy vertical rib running almost the full length which is machined to fit the side head. All twist-ings strains set up



Cincinnati Hypro Vertical Boring and Milling Machine

in the machine while doing side head turning are equally distributed over the wide face pyramid housing.

The rail is of Hypro design, having a deep box arched back, a solid narrow guide at the bottom, and a supplementary bearing at the top to afford added insurance against tilting of the heads while performing heavy cross feeding operations. Saddles are provided with spring-loaded roller bearings at the top which help carry the head weight and make for more ease of operation. Precision adjustment handles are provided with graduated collars and can be positioned to suit the operator's convenience.

A one-piece conical type square locked designed swivel is used on the boring head. The conical type swivel helps distribute the twisting strains inherent in boring and turning over the entire saddle area. The swivel has the support of the extended saddle and also has an extra long clamping arm.

Scales are provided on both the rail, rams, milling head quill, righthand housing, and table.

The feed of the boring head is adjustable from 1/96 to 0.8 inch in 12 mechanical gear changes in geometric progression. Individual feed and traverse box is provided for each head. Feed and traverse boxes are fully anti-friction, and lubrication is provided by means of a pump built into each box. Safety clutches built into each end of the rail are loaded to accommodate maximum horsepower, thus eliminating any damage to the machine.

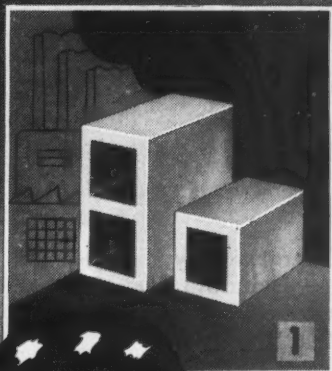
The milling head cross feed is obtained through an entirely separate feed unit mounted on the left-hand housing. Traverse is obtained through this same box. Cross feeds to the milling head range from 1/4 to 8 inches per minute. The same selector box feeding and traversing is used for both the milling and boring head so as to avoid confusion on the part of the operator when changing from turning and boring to milling.

The milling head is a standard 7 1/2 inch quill of the latest Hypro design, being fully Timkenized and having an individual 10 h. p. drive motor. The gearing in the head is of hardened alloy steel, shaved and lapped. All gears are mounted on large diameter multiple splined shafts. The quill is manually operated and has a 10-inch down feed. The complete head, gearing, and bearings are lubricated through a pump unit built into the head.

Twelve speeds ranging from 21 to

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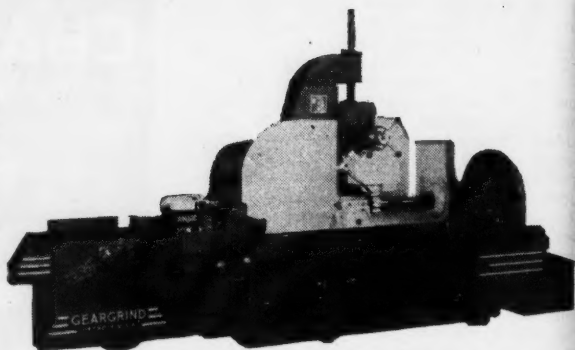
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377 r. p. m. are provided in the head. The electrically controlled elevating mechanism is mounted on the extra depth box type arch, and is of simplified design and completely independent of the balance of the machine.

All functions of the machine are electrically interlocked so that ordinary inadvertent errors in operation will result in no damage.



Geagrind Type GG-24-48 Grinding Machine

Geagrind Type GG-24-48 Grinding Machine

A heavy duty formed wheel grinding machine designated as the Geagrind Type GG-24-48 has been announced by The Gear Grinding Machine Co., Detroit 11, Mich. The grinder is designed to handle either coarse or fine-pitch gears with diameters up to 24 inches. It has a maximum distance between

centers of 48 inches.

The base of the machine is of extremely heavy construction, and the grinding wheel column is unusually rigid. The low design of the base affords a low center of the work. Work areas are painted spotlight buff to provide for maximum visibility, easier and faster inspection, and increased safety to the operator.

The index control is such that in-

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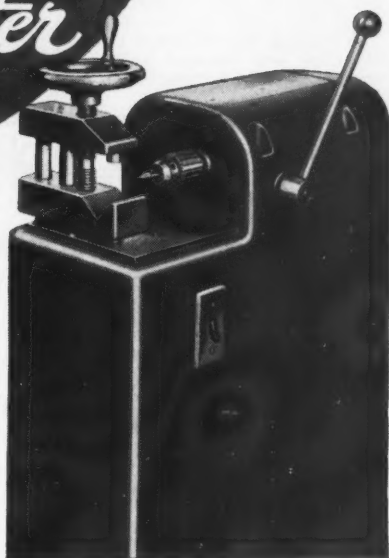
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THIS machine is a speedy, easy and accurate performer. It's so easy to use that any workman can handle it. You simply insert one end in the Vee-Block, tighten the hand wheel and advance the center drill—then reverse the bar and center the other end. The **Quickcenter** will do in less than a minute a job that may take over half an hour on a lathe—and do it far more easily and more accurately. The **Quickcenter**, small and compact, increases shop output, uses unskilled operators, saves time and material—and increases your profit.

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dexing can be effected at both ends of the stroke or on the tailstock end of the machine only. The index cycle stop is selective from 0 to 400 indexes and may be adjusted at any point in the cycle.

The travel of the grinding wheel carriage to wheel trimming position is automatic. This automatic travel can be made after any predetermined number of cycles (complete revolution of the work) or it may operate as a tooth-to-tooth index. In case of index failure, an electrically interlocked safety circuit stops all movement of the carriage.

The motor-driven workhead spindle allows for checking the work runout with an indicator. The spindle is mounted on precision tapered roller bearings. The 38-inch diameter index worm wheel is driven by a precision hardened and ground worm $4\frac{1}{2}$ inches in diameter mounted on precision tapered roller bearings. Both the worm and wheel operate in oil.

The Geargrind Type GG-24-48 Grinding Machine is designed to accommodate either a 4-to-1 or 6-to-1 trimmer. The piping and hydraulic pump of the machine are located at the rear and are enclosed in a removable cover.

Bodine No. 48 High Speed Automatic Nut Tapping Machine

The Bodine Corp., 317 Mountain Grove St., Bridgeport, Conn., has brought out a high speed fully automatic nut tapping machine which is designed to deliver four nuts simultaneously to four tapping stations by means of two hopper feeding mechanisms, each equipped with two adjustable chutes. The machine, which is designated as the No. 48, is primarily designed for tapping Class 3, 4, and 5 threads.

The outstanding feature of the machine is the lead screw precision control of all four spindles, which are operated simultaneously by one segmental gear drive that starts taps at slow speed, then reverses at double the tapping speed. The threads on the master screw and its spring-tensioned nut match those of the tap. Screws and nuts are changed when tap pitch is changed.

With the Bodine No. 48 Tapper, four precision-tapped nuts are produced per stroke, each nut being discharged to its individual collecting box so that the production of each spindle may be individually gaged. Two sizes of nuts



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broached on Footburt machines. Production in most cases is as fast as the speed at which parts can be loaded, yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

THE FOOTE-BURT COMPANY

CLEVELAND 8, OHIO

Detroit Office: General Motors Building

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Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*

**Bodine No. 48 High Speed Automatic
Nut Tapping Machine**

The production rate of the machine is dependent upon tap size, threads per inch, nut thickness, material and cutting speed allowable, coolant used, and so on. Maximum speed recommended is 45 strokes per minute, which provides for a production of 9,000 precision tapped nuts per hour.

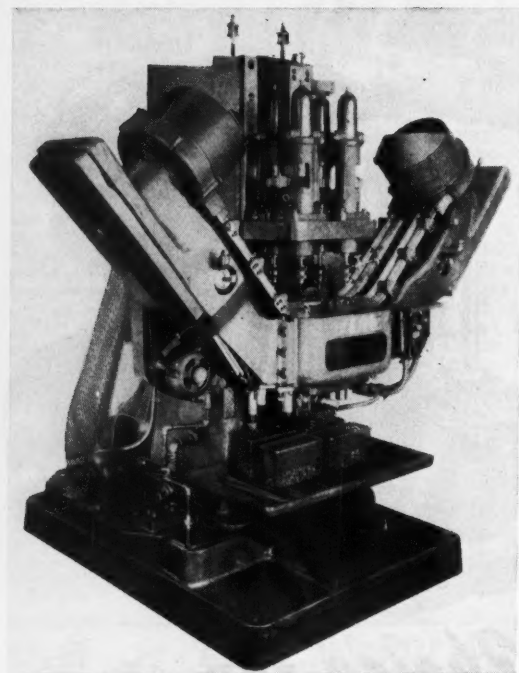
The Bodine No. 48 Tapper can be used for tapping any nut blank up to $\frac{1}{2}$ inch that can be hopper fed. The machine is designed to tap 13 threads per inch in mild steel or its equivalent.

**DoAll Model G-1
Surface Grinder**

So designed as to enable inexperienced operators to produce fine finishes to within six micro-inches in workpieces using standard grit wheels, the DoAll Model G-1 Surface Grinder

shown in the accompanying illustration is now being offered by Continental Machines, Inc., 1306 S. Washington Ave., Minneapolis 4, Minn. According to the manufacturer, an innovation in design provides for maximum operating convenience and allows for unusually close inspection of work while being ground.

Built for toolroom use and light production work where accuracy is paramount, the DoAll Model G-1 Surface Grinder has a table travel of 21 inches



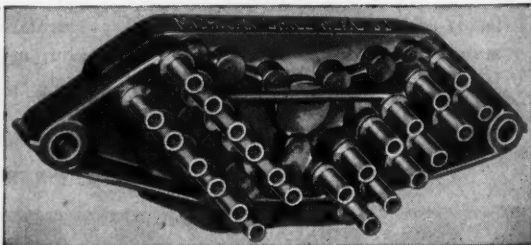
may be tapped at one time, each hopper delivering two blanks of each size. Safety interlocks prevent starting of any motors in wrong sequence and eliminate possibility of operating taps until blanks are in correct working position.

If "commercial" threads (Classes 1 and 2) are to be tapped, lead control spindles are not required. For such work, spring-compensated type spindles can be supplied.

Pictured: a 24-Spindle Heavy-Duty Drill Head.

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ING EQUIPMENT.**

We invite your inquiry.



MICHIGAN DRILL HEAD CO. 971 E. 8-Mile Road, Hazel Park, Mich.

THE DIE-SINKER WHO

*wasn't
satisfied*



Fully 30 years ago, he decided there must be some less tedious way to "clean up" his dies . . . to get the hard, sharp contours true to the blueprint design. So he himself invented the way—and the hand-cut rotary file thus arrived to substitute quick precision for tiresome drudgery.

His experience then—and through

the score of subsequent years devoted to rotary file pioneering—is all part of RFC history. Many hundreds of industrial plants have profited by this experience . . . and today recognize RFC HAND-CUT ROTARY FILE accuracy and speed as genuine factors in promoting War plant and essential civilian-use production.

How can RFC rotary files help you? A discussion may uncover applications—and important benefits—that may surprise you. Or, write for the RFC catalog.



DoAll Model G-1 Surface Grinder



vide maximum rigidity, the machine weighs 2,200 lb.

The column, which extends from the bottom of the base of the machine up to the spindle, is recessed into the base to afford maximum rigidity to the spindle. The saddle has large, extra-heavy double V-ways to prevent any "angle feeding" and to provide for long life. Total hand - scraped way area is 386 square inches. The working area is completely supported to assure parallelism and flatness over the entire area. The 21-inch transverse travel and 7½-inch cross-feed travel afford sufficient working area for grinding parts on 6 x 18-inch chucks.

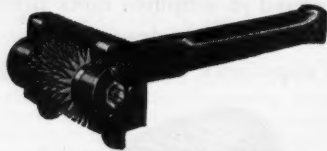
and transverse travel of 1½ inches, with vertical wheel head adjustment of 12 inches using a 7 x ½ x 1¼-inch wheel. Scientifically balanced to pro-

A specially constructed combined hydraulic control unit provides for control of the five hydraulically actuated movements of the machine. When the

DESMOND GRINDING WHEEL DRESSERS



Desmond Hex Dresser



Desmond Heavy-Duty Dresser



Desmond Huntington Dressers

Our Desmond Huntington Cutters are made in all sizes.

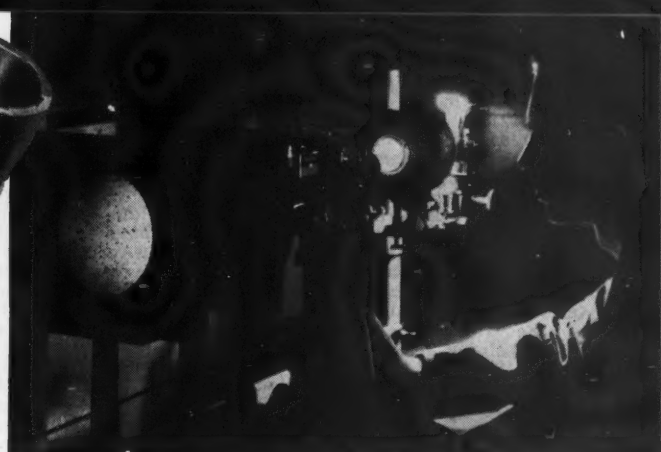


We manufacture only complete line of dressers and cutters on the market, and will be glad to send samples for trial. Write for copy of our new catalog and name of your nearest jobber.



THE DESMOND-STEPHAN MFG. CO.
URBANA • OHIO

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THE RIGID METALLURGICAL AND
MANUFACTURING CONTROL OF

BUCKEYE BEARINGS

Assures thorough dispersement of all component metals and freedom from porosity resulting in unsurpassed serviceability

● Manufactured from selected metals under Buckeye's complete laboratory control of charging ratios and melting and pouring temperatures, assures the production of a uniformly high quality of product, each piece of which, month after month measures up fully to Buckeye's exacting specifications.

For easy assembly and long efficient satisfactory service, specify Buckeye bearings by brand name. They are furnished fully finished in 1088 ready-to-use stock sizes—in cored and solid 13" bars—in several graphited styles—and in any OD, ID and length, slotted, split, drilled or flanged, exactly to customer's blue-print. No order is too big or too small for Buckeye.

Let us quote on your requirements.

Buckeye

BRASS AND MANUFACTURING COMPANY

6412 HAWTHORNE AVE.

BRONZESMITHS

SINCE 1900

CLEVELAND, OHIO



BRONZE SLEEVE BEARINGS • STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT
IN ANY RECOGNIZED BEARING METAL ANALYSIS

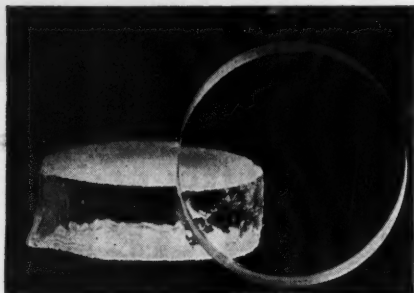
grinder is under automatic operation, the cross-feed screw disengages automatically, thus greatly adding to the life of this screw for use in manual operation of the machine.

Standard equipment of the DoAll Model G-1 Surface Grinder includes a direct motor driven, precision ball bearing spindle. The spindle head is specially built to accommodate this spindle and is lapped for precision spindle fit. The wheel head can be raised or lowered by means of a graduated handwheel operating the vertical adjustment screw through a single gear contact for posi-

tive movement. Gears are hardened and ground, with the vertical adjustment screw operating through a 4-inch bronze nut to minimize wear. An important feature is the adjustable wheel guard which can be lowered to compensate for wheel wear or adjusted for individual application. The guard is also removable without taking off the wheel.

Convenience in operation of the machine is afforded by the specially designed base which is recessed to provide knee room for the operator. Electrical controls are recessed into the front of the base and are readily accessible. The cross-feed screw is located in the center of the saddle to provide smooth cross-feed action. The built-in hydraulic oil reservoir and pump unit is rubber mounted to prevent transmission of pump and motor vibration to the workpiece. Complete automatic pressure lubrication is provided to all the ways and moving parts of the machine.

The DoAll Model G-1 Surface Grinder is designed for wet or dry grinding and for automatic hydraulic feed or smooth-operating manual feed.



Specify Van Keuren double surface, quartz optical flats

They are the most economical to buy, and the most accurate to use. Write for Catalog No. 32 giving complete information.

25TH YEAR

THE VAN KEUREN CO.

177 WALTHAM ST., WATERTOWN 72, MASS.

Knapp-Lee Magnesium Preheat Furnace

Illustrated herewith is a preheat furnace for magnesium sheets and plates which has been developed by the James H. Knapp Co., Inc., 4920 Loma Vista Ave., Los Angeles 11, Calif. The furnace, which is designed to provide temperatures up to 600 deg. F., has a capacity for seven sheets of magnesium alloy up to 4 feet wide, 12 feet long, and 1/4 inch thick.

Self-contained, the Knapp-Lee Magnesium Preheat Furnace is mounted on four ball bearing double casters for

"OUTWEARS

the best

Bronze Metal"

20 years ARGUTO without
K R a drink—

ARGUTO OILLESS BEADING CO.

Wayne Junction, Philadelphia, Pa.

Abrasive and Mandrel Wedded for Life

Mandrels of Blue Flash Mounted Wheels and Points retain their grip until the abrasive is completely used — so you get *all* the grinding you pay for. A special method of knurling the mandrel, and then cementing, guards against loosening, despite hard service. Furthermore, the Bay State *extra* is to size and shape on the mandrel, which automatically provides a positive test for adhesion of abrasive to mandrel.

A unique and improved manufacturing method by which each shape is accurately formed from a large blank, insures that the abrasive is uniform and consistent right down to the mandrel. Such consistency is maintained even in smallest sizes.

Give Blue Flash Mounted Wheels and Points a trial. You'll find they need no breaking-in period, will run absolutely true, have no hard and soft spots to give trouble, and can be used right down to the mandrel.

Just such features as these have made the complete line of Bay State Blue Flash Grinding Wheels first choice in a great many plants.

Write for helpful literature on the products you use, including a copy of Bay State's handy, pocket-sized catalog on Blue Flash Mounted Wheels and Points.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.



BLUE FLASH GRINDING WHEELS

FAST and COOL



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the best

Bronze Metal"

20 years ARGUTO without a drink—

ARGUTO OILLESS BEARING CO.

Wayne Junction, Philadelphia, Pa.

Abrasive and Mandrel Wedded for Life

Mandrels of Blue Flash Mounted Wheels and Points retain their grip until the abrasive is completely used — so you get *all* the grinding you pay for. A special method of knurling the mandrel, and then cementing, guards against loosening, despite hard service. Furthermore, the Bay State extra is to size and shape on the mandrel, which automatically provides a positive test for adhesion of abrasive to mandrel.

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BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

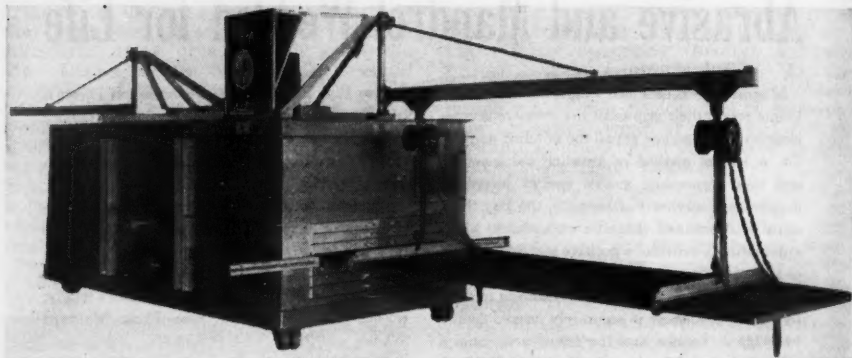


BLUE FLASH GRINDING WHEELS *FAST and COOL*



December, 1944

MODERN MACHINE SHOP 259



Knapp-Lee Magnesium Preheat Furnace

movement to the presses where the magnesium is to be hot formed. The design of the unit provides for loading and unloading of sheets through seven double doors on either end.

Electrically heated, the furnace is equipped with three blowers which are fastened on a single shaft. Heating elements in the plenum chamber are located in front of the blowers and ex-

tend the full length of the furnace. A Leeds & Northrup potentiometer recorder controller with special contacts provides for reduction in heat input for the "soaking" period or for low temperature operation.

Jib boom with chain hoist is provided at each end of the furnace for use in handling the hot tray loads. The booms are arranged so that they can be folded



MODEL
1236
36-in. Throat
12-Gauge
Capacity

CIRCLE CUTTING ATTACHMENT
Included as Standard Equipment
With This Machine

3-11-43

Cuts...inside or outside...straight or curved...flat sheets or formed work

Even an unskilled operator can follow a scribed line, easily and rapidly. Shears flat or formed sheet metal, internal or external, plain or irregular shapes. Vision is unobstructed; both hands are free to guide work at all times. No resistance to feeding or turning. Action of cutters does not "feed" material. *Write for Bulletin.*

Made in sizes up to 60-in. throat, 10-gauge capacity

**Cleaner, smoother edges
...need no finishing**

Libert **Hi-Speed** SHEAR

LIBERT MACHINE COMPANY, GREEN BAY, WIS.

Snap-on Tools

The
Choice of Better
Mechanics

The unerring appraisal of men who **KNOW** tools . . . the skilled mechanics whose earnings depend on the accuracy, flexibility and speed of the tools with which they work . . . their preference has made Snap-on foremost in the tool field. In service shop or production line . . . and on maintenance operations throughout industry . . . Snap-ons are the *choice of better mechanics*. Snap-on direct-to-user tool service is available through 38 factory branches in key production centers.

Snap-on Tools

FOR PRODUCTION AND MAINTENANCE

SNAP-ON TOOLS CORPORATION, 8032-L 28th Avenue, Kenosha, Wis.

December, 1944

MODERN MACHINE SHOP 261

In War, as in Peace...

CERRO ALLOYS

Save time and cut costs!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc., and many similar applications.

REPRESENTATIVES AND DISTRIBUTORS

Brooklyn, N. Y., Belmont Smelting and Refining Works

Ansonia, Conn., Jackson Associates

Boston, Mass., Jackson Associates

Philadelphia, Pa., Castaloy Metal Sales Co

Cleveland, Ohio, Die Supply Co.

Detroit, Mich., Castaloy Metal Sales Co

Chicago, Ill., Sterling Products Co., Inc.

Moline, Ill., Sterling Products Co., Inc.

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Minneapolis, Minn., Northern Machinery & Supply Co.

St. Louis, Mo., Metal Goods Corporation

Kansas City, Mo., Metal Goods Corporation

New Orleans, La., Metal Goods Corporation

Dallas, Tex., Metal Goods Corporation

Houston, Tex., Metal Goods Corporation

Los Angeles, Calif., Castaloy Metal Sales Co.

Tulsa, Okla., Metal Goods Corporation

Montreal, Can., Dominion Merchants, Ltd.

London, Eng., Mining & Chem. Products, Ltd.

Cerro De Pasco Copper Corporation

40 WALL ST.

NEW YORK 5, N. Y.

back over the furnace to make the overall dimensions approximately 9 feet high x 9 feet wide x 17 feet long. Overall length of the furnace with booms extended is approximately 38 feet.

Rotorex Precision Tapping Attachment

The addition of a precision tapping attachment to its line of Rotorex products is announced by Douglas Machin-



**Rotorex Precision Tapping Attachment
Installed on Drill Press**

ery Co., Inc., 150 Broadway, New York 7, N. Y. The attachment, which may be readily installed on standard 14 or 17-inch Delta drill press without any alteration, is designed to provide for controlled positive lead tapping and an automatic cycle, thus enabling unskilled operators to consistently produce Class 3 or better threads, it is claimed.

The lead screw is hardened and ground, has a large bearing surface, is well protected against chips and dirt, and is adequately lubricated. Of

★ **MORE WORK** ★ **BETTER FINISHES**
★ **LESS TOOL WEAR**

Atlas ALL-PURPOSE COOLANT SYSTEMS

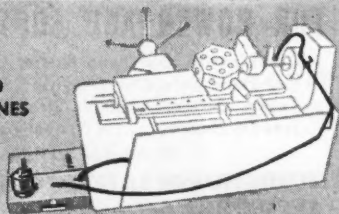
COMPLETE READY TO INSTALL
\$39⁷⁵★ and \$49⁷⁵★

NOW you can buy an Atlas Coolant System COMPLETE . . . ready to convert any machine tool into a faster, better production set-up in only a few minutes! Pump, tank, and feed and return system come ready to install on lathes, drill presses, millers, grinders, cut-off saws, screw machines. Attaching brackets and flexible feed lines make the system readily adaptable to any special set-up. Maximum capacities 225 and 450 GPH. Send for catalog.

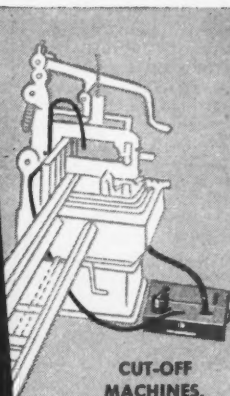
ATLAS PRESS CO.

1246 N. PITCHER STREET, KALAMAZOO 13D, MICHIGAN

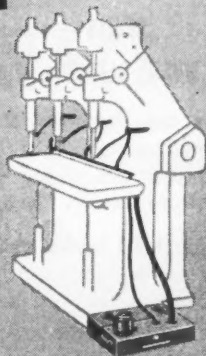
LATHES AND
SCREW MACHINES



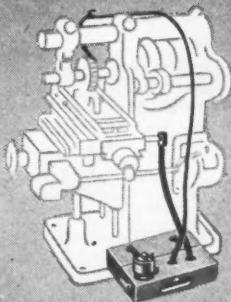
CUT-OFF
MACHINES,
SAWS, ETC.



DRILLING
MACHINES
AND DRILL
PRESSES



MILLING MACHINES



large diameter, the screw is mounted as close as possible to the chuck to eliminate any errors in lead which may be introduced by the torque or wind-up effect of the spindle under heavy load. The lead screw and meeting nuts are available in pitches from 11 to 72 threads per inch.

In use, the adjustable threaded collar of the Rotorex attachment is set for predetermined depth, and when pressure is applied to the foot pedal, the spindle revolves and the tap is fed into the work. As long as the foot pedal is held down, the tap will continue to enter the

work until it reaches a predetermined depth, at which point it will automatically reverse, back out, and stop. Should the operator wish to reverse the tap before it has reached the predetermined depth, he may do so by merely releasing the pressure from the foot pedal.

Gear Specialties

SPURS — HELICALS (14 to 96 D.P.)

BEVELS — (straight and spiral)

WORM GEARING — THREAD GRINDING

As manufacturers of high precision small gears for numerous vital controls used in this highly mechanized war, we are literally "swamped."

Therefore, under existing conditions, we are forced to minimize further commitments unless they have W.P.B. urgency support.

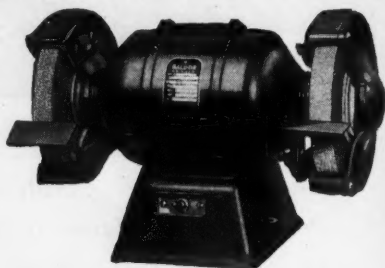
Gear Specialties

MANUFACTURERS

CHICAGO

Baldor Series 7100 Grinder

An improved 7-inch grinder designated as the Series 7100 is announced by the Baldor Electric Co., 4351 Duncan Ave., St. Louis 10, Mo. The unit features a specially designed motor which is said

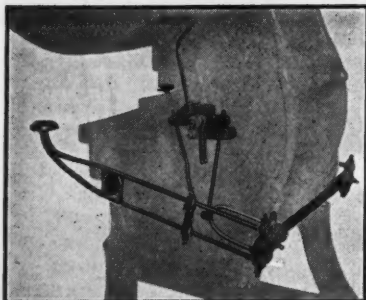


Baldor Series 7100 Grinder

to be cool running at normal loads and which has a 100 per cent overload capacity.

The design of the grinder also includes pre-lubricated ballbearings which are said to require no lubrication during their entire life; first grade wheels balanced with Baldor patented balancing flanges; and tool rests which are adjustable horizontally, vertically, and angularly.

The Baldor Series 7100 Grinder can



SAFETY EQUIPMENT FOR POWER AND FOOT PRESSES

Combination Gate and Barrier Guards
Two-Hand Safety Starting Devices
Sweep Guards... Single-Stroke Attachments
Treadle Guards... Fly Wheel Guards, etc.

Write for Details

JOHN HUMM SAFETY EQUIPMENT CO.
251 SHEFFIELD AVE. BROOKLYN, N. Y.

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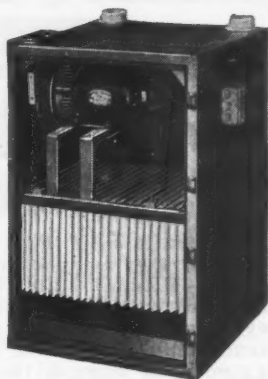
Don't Gamble— with the **DUST MENACE—** GET **TORIT** PORTABLE DUST COLLECTORS

TORIT Dust Collectors draw dust laden air from hoods surrounding grinding, cutting and polishing wheels down through a compartment in the cabinet then up through a set of filter bags. The dust is, therefore, trapped on the outside of the bags so it is easy to keep them clean.

TORIT Dust Collectors are installed by piping directly to the abrasive wheels. This eliminates the extensive piping of a central system and being completely self-contained, TORIT can easily be moved about to meet new production setups.

Write for the TORIT Dust Collector catalog giving full information and description of different size units.

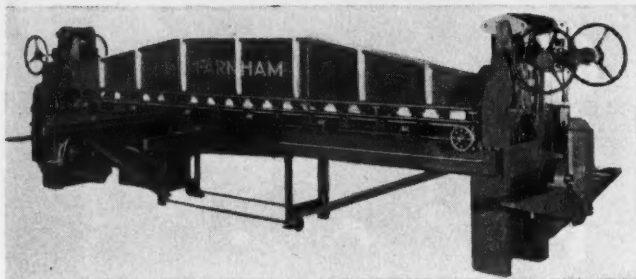
▶ **Torit-ize for Safety** ◀



TORIT MANUFACTURING CO.
296 Walnut St. St. Paul 2, Minn.

TORIT Dust Collectors
SELF-CONTAINED UNITS

Farnham Forming Roll



tour in one pass through the machine. Flat aluminum alloy sheets are fed into the machine from one side, the finished curved parts emerging from the other. Thus, the former process of

be obtained with $\frac{1}{4}$ h. p., 1700 or 1725 r. p. m. motor, or $\frac{1}{2}$ h. p., 3400 or 3440 r. p. m. motor. Grinding wheels are 7-inch diameter x 1-inch face x $\frac{5}{8}$ -inch hole.

Farnham Forming Roll

The accompanying illustration shows a new model Farnham Forming Roll announced by Paragon Research, Inc., 2061 S. Park Ave., Buffalo 20, N. Y. The design is such that leading edge skins or fuselage skins are said to be automatically formed to desired con-

changing dial settings and reversing rolls several times is eliminated.

The movement of the upper roll is controlled by two templates, one on each end of the machine. As the part is fed through the rolls, these templates provide for raising or lowering of each end of the upper roll as required to form the proper contour. Hydraulic pressure is used to keep template followers against the rolls, and also to quickly raise the upper roll for inserting the sheet to be formed. Adjustable stops are provided for locating sheets properly in the rolls.

All advantages of previous model

NEED GOOD? COOLANT PUMPS?

BRADY-PENROD MODEL 7500
Centrifugal coolant pump and tank—a neat, compact unit highly suitable for use where abrasives are a factor.

Good pumps PAY. Buy the kind used as standard equipment by many leading machine tool manufacturers—BRADY-PENROD. Model 7500, shown above, is one of a complete line designed to meet every need. It handles all coolant liquids—kerosene, solubles, light and medium oils, etc., 4 to 100 g.p.m. Tank sizes, 6, 15, 30 gal. or larger, with as many hoses and nozzles as required. Discharge pipe is cast integral with pump and brought to outside of tank. The hinged cover allows cleaning without disconnecting return line.

Brady-Penrod

Incorporated

325 E. Eighteenth St., Muncie, Indiana, U. S. A.
1945 Santa Fe Ave., Los Angeles, Calif.



All BRADY-PENROD pumps have heavy-duty, standard construction NEMA motors, $\frac{1}{4}$ to 1 H.P., any current, phase, cycle.

● THE TOOL OF INDUSTRY ●



This is BILLINGS

1869

75TH YEAR

1944

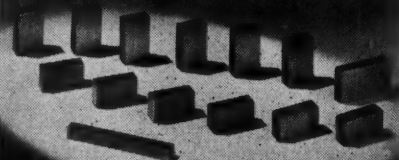
Billings Wrenches are found today in every nook and corner of the globe, building and maintaining our machines of war. We appreciate the importance of this responsibility and, as long as there is a war to win, it must come first.

But one eye on the future is a 75-year-old-habit at Billings and now, least of all, should that habit be changed. We recognize that unusual demands to come must be answered with even better Billings Wrenches.

Craftsmen Since 1869



TAKE A TIP



"HARDSTEEL" TOOL TIPS

**Save money and
machine time on
the tough jobs**

"HARDSTEEL"—the metal that has made it possible to drill steels hardened by any process without annealing—the metal in tool bits that has set new production records for machining tough and abrasive steels and other alloys—is now available in accurately ground tool tips.

Brazed to the tool shank by your customary method, "HARDSTEEL" Tool Tips will help you speed production and introduce a new economy into your plant operations—put you in a fine position to face after-the-war competition.

*Made any size to
your specifications.*

Ask for your copy of the new "HARD-STEEL" Operator's Manual,—valuable to production men interested in more output at lower cost—but sent free on request.

BLACK DRILL CO.
Division of BLACK INDUSTRIES
1400 East 222nd Street
CLEVELAND 17, OHIO



**TAKE A
"HARDSTEEL"
DRILL**

**from the Tool-
room Every Time
You Need to Drill
Hardened Steel.**

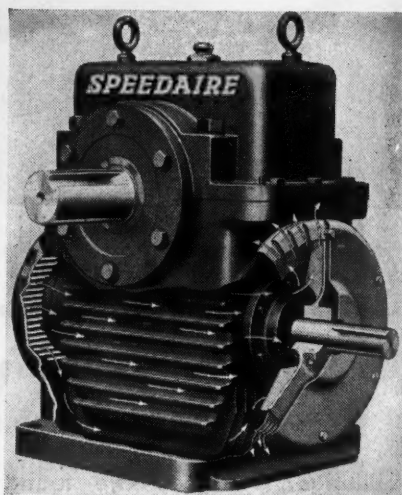
Sizes to 1-inch.

"HARDSTEEL"
DRILLS • TOOL BITS • SPECIAL TOOLS

Farnham Forming Rolls, such as minimum nose radius and tapered sections, are retained in the new model shown, which, it is claimed, will form aluminum alloy sheet $\frac{1}{8}$ inch thick x 15 feet long to a minimum radius of $1\frac{1}{4}$ inches.

Speedaire Worm Gear Reduction Unit

Announced by the Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio, is a (Speedaire) worm gear reduction unit incorporating a fan cool-



Speedaire Worm Gear Reduction Unit

ing system which is said to permit a pronounced reduction in the size of the unit required for a given h. p. output. The basis of the cooling system is a double-wall construction that provides an air passage completely enveloping the oil reservoir in which the gear operates. The inner housing wall forming the oil reservoir is deeply finned on the air side to provide maximum heat-dissipating surface.

An exhaust fan located on the coupling end of the worm shaft draws air at high velocity through the space between the housing walls from a grill at the opposite end of the unit. The fan is designed to operate with either direction of rotation. The effect of the double-wall construction is to maintain a uni-

Before
AND
After

V-DAY



UNITED STATES ELECTRICAL TOOLS
HELP INCREASE PRODUCTION
AND CUT COSTS

THIS IS BASIC . . . it's the fundamental reason for using these practical, dependable electrical tools. They're precision designed, engineered and built—brought to their present state of perfection "the hard way"—not as the product of imagination, but of actual working experience on land, sea and in the air. Put United States Electrical Tools to work for *you*. They'll step up production, improve quality, cut costs.

HEAVY DUTY FLOOR GRINDER

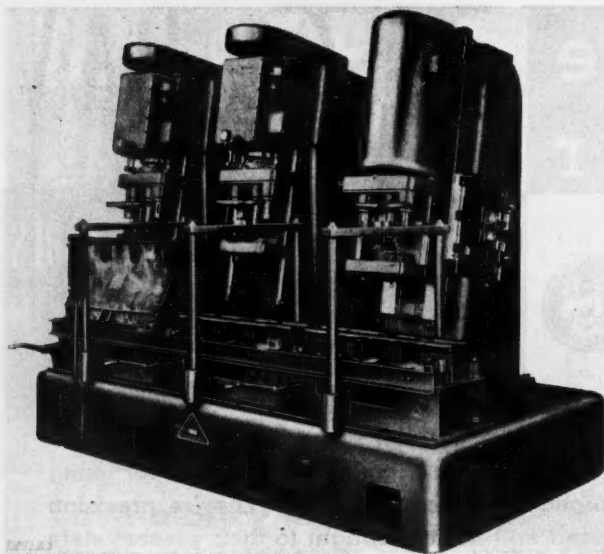
MODEL 10—for 12" to 20" wheels. Semi-steel wheel guards, hinge type, adjustable to wheel wear. Heavy duty service motors. Heavy duty enclosed ball bearings support heavy, one-piece alloy steel spindle. Push-button control. Shaft-locking device for holding shaft while renewing wheels.



Write us for delivery dates. Some models available for early deliveries.

The **UNITED STATES ELECTRICAL TOOL Co.**
CINCINNATI, OHIO

LeMaire Three-Station Drilling Machine



three-station drilling machine developed by this firm. By being conveyor indexed, the machine provides a progressive setup that eliminates considerable handling of heavy parts from one machine to another.

The first station of the machine is used for drilling four holes through the solid surface of the casting. One of the holes is also counterbored and spot-faced to $2\frac{3}{4}$ inches in diameter. The second station, which includes a four-spindle head, provides for the semi-

form flow of cooling air against the fins and housing wall over the entire oil reservoir surface, thus lowering operating temperature and affording the unit great load-carrying capacity.

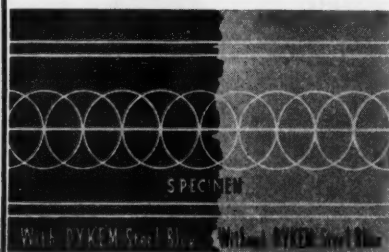
LeMaire Three-Station Drilling Machine

According to an announcement made by the LeMaire Tool & Mfg. Co., 2659 S. Telegraph Rd., Dearborn, Mich., holes in huge truck cylinder blocks can now be rough drilled through the solid casting, then semi-finished and finish-reamed, all in one cycle, by means of the large,

finish reaming the holes. The third station is used in finish reaming two $1\frac{1}{2}$ -inch holes and two 2-inch holes within an accuracy of 0.001 inch.

The drill heads of the first two stations are driven by standard No. 5,000 twin ram hydraulic power units mounted at 10-deg. angles on the faces of the columns. The third station includes a sliding type unit that slides on machined ways 63 inches long x 4 inches wide, spaced 16 inches apart.

The three columns are solidly anchored to a substantial cast base, as shown in the illustration. The features of the machine are: simplicity of design, ample power, smooth operation, and accuracy.



DYKEM STEEL BLUE

Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY

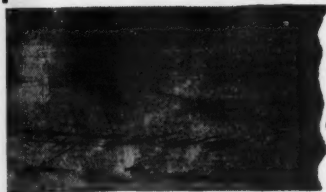
2301 F. NORTH 11th ST.
(In Canada: 444 Pacific Av., Toronto, Ont.)

ST. LOUIS, MO.

What is DIE-LESS DUPLICATING?

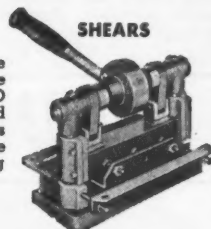
Here is a simple 3-STAGE explanation:

"DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines — Shears, Brakes, Benders — especially when used as a continuous, integrated production process.

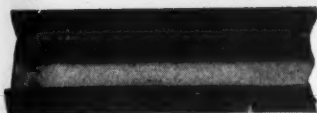


← 1st Stage

Cutting flat material to size and shape for part to be duplicated. The DI-ACRO Shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. 3 sizes,—shearing widths 6", 9", 12".



SHEARS



← 2nd Stage

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. 3 sizes,—folding widths, 6", 12", 18".

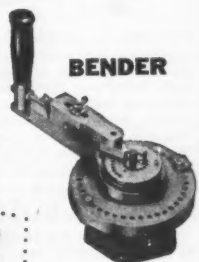


BRAKE



← 3rd Stage

Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing, wire (round, square, flat), strip stock and other ductile materials in a remarkably wide range.



BENDER

DO YOU HAVE DUPLICATE PARTS TO FORM? . . .

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided — deliveries speeded up.

Send for Catalog—"DIE-LESS DUPLICATING"

It gives full details on all models of DI-ACRO Shears, Brakes, Benders, and many examples of parts made with "DIE-LESS DUPLICATING."

Di-Acro is pronounced "Die-Ack-RO"

of accurate contour forming. 3 sizes,—radius capacity 2", 6", 9", handling up to 1/2" cold rolled steel bar.



O'NEIL-IRWIN MFG. CO.

306 8th Ave. S., Minneapolis 15, Minnesota

Dalzen "2-in-1" Machine

A machine which can be readily adapted to perform both center lapping and drill press operations, to be known as the Dalzen "2-in-1," is announced by the Dalzen Tool & Mfg. Co., 12255 E. Eight Mile Road, Detroit 5, Mich. One simple adjustment is all that is said to be required in order to change the machine from a center grinder to drill press, or vice versa. The accompanying illustration shows the machine being used as a drill press with the center grinder dresser swung out of position.



Dalzen "2-in-1" Machine

MILWAUKEE SURFACE PLATES



36" x 48" . . . semi-steel . . . accurately machined. Securely mounted cast legs are machined and provided with adjusting screws for perfect alignment. Shipping weight, 1300 lbs. Also larger or smaller plates with planed or scraped surface. We also manufacture angles and parallels as shown underneath surface plate.
Write for details.

J. C. BUSCH CO.

Engineers and Machinists Since 1907

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The Dalzen 2-in-1 Machine is easily portable, weighing only 165 lb. The unit is 67 inches high and includes a floor stand measuring 15 x 21 inches. The 10 x 10-inch work table is smooth machined and slotted for T-bolts. The maximum distance between the centers of the machine shown is 39 inches, however, machines with greater center distances can also be obtained.

When used as a drill press, the Dalzen 2-in-1 Machine has a $\frac{1}{2}$ -inch capacity and will drill to the center of a 13-inch circle. The center grinder dresser is adjustable from 20 to 100 deg. The spindle of the machine rotates on two precision ball bearings, and a double bearing is provided at the lower end



HINGES

**VARIOUS WIDTHS
and GAUGES**



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CONTINUOUS LENGTHS**

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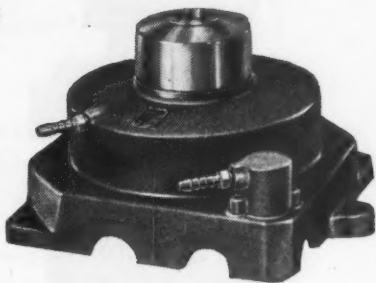
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for you now as hundreds of progressive factories are doing. It's ready to do a thousand jobs in your plant with speed, simplicity, economy. No other power is so easily brought to points where needed, so easily put to work, so clean and safe to operate. No other power is so mechanically simple, yet versatile; so low in initial cost nor so economical to maintain. Do you need tremendous pressure or a delicate flexible touch? Mead Air Power has both. Do you want to move things—lift them, tilt them, slide them, hold them—faster, better, more cheaply? Use Mead Air Power. To speed war work—and get a running start into faster, more economical Post-War production setups, investigate Mead Air-Operated devices now. Prompt delivery in most cases.



AIR PRESSES



AIR CLAMPS



FLAT TOP WORKHOLDER



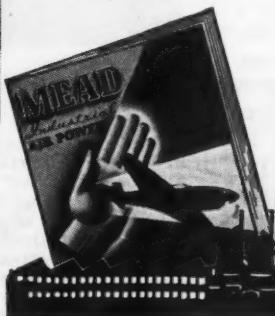
AIR VISES



MIDGET AIR CLAMPS

CATALOG READY

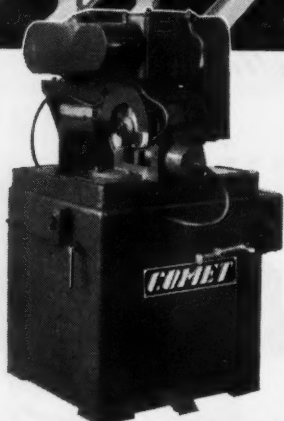
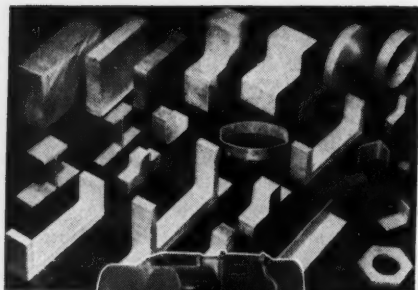
Send for copy of our new Air Power Catalog illustrating, describing many new man- and-money- saving devices.



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CUTS METAL FASTER *More Accurately*

If you require accurate, high-speed cutting of non-ferrous metals and other materials, here is your machine. Cuts by smooth, fast, milling action. Pneumatic hydraulic feed is coordinated with speed of cutting blade. Vise synchronized with action of ram. No vibration because of weight distribution. Has 4 speed transmission and variable feed mechanism. Built-in coolant system. Properly operated, blade breakage is eliminated. Write or wire for free literature.

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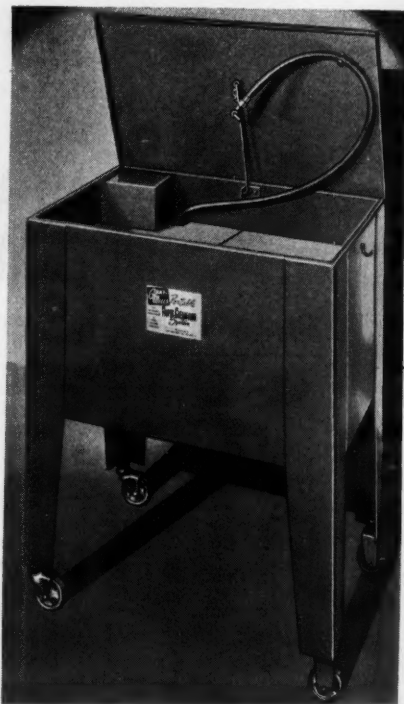
COMET
AUTOMATIC CUT-OFF MACHINE
MODEL MH

to take the thrust.

The Dalzen 2-in-1 Machine is supplied complete with 110-volt motor, V-belt drive, diamond, and 1½-inch lapping stone.

Gray-Mills Parts Cleaning System

A parts cleaning system combining the utility of two washers into one self-contained portable unit has been an-



Gray-Mills Parts Cleaning System

nounced by the Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill. The system includes a portable cleaner with a unique "swisher" feature and cold-cleaning Flo-Bac solvent.

Large parts requiring individual handling are cleaned of grease and grime by a strong stream of solvent pumped from a tank below. Smaller parts may be washed in quantity by merely pouring them into a basket and immersing

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HOW TO CUT THREADS IN THE NEW

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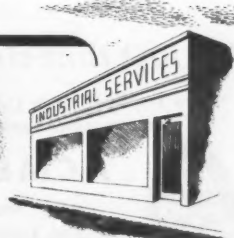
AGE

ARE YOU PLANNING TO USE NEW MATERIALS AFTER THE WAR?

Experimenting in the threading of materials that are new to you can be an expensive, time-wasting process.

Magnesium, aluminum, various plastics, and other materials which are being used more and more widely require individual threading shop practice. The Greenfield Tap and Die Corporation has had wide experience in threading all kinds of materials and is ready to help you select—quickly and efficiently—the proper threading tool and gaging setup for your product.

SIMPLY CALL "THE GREENFIELD MAN"—THROUGH
YOUR GREENFIELD DISTRIBUTOR.



GREENFIELD TAP and DIE CORPORATION • Greenfield, Massachusetts

December, 1944

MODERN MACHINE SHOP 275

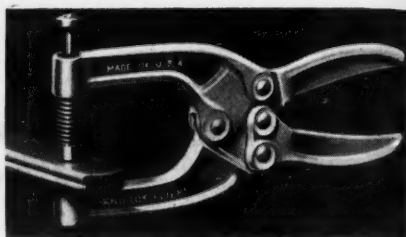
in solvent. The two-section shelf provided may be removed, thus affording access to the dipping tank below. The dipping basket rests on a simple, hand-operated "swisher" device, which speeds the cleaning operation by providing a convenient method for agitating fluid.

Parts such as castings, gears, bearings, carburetors, air cleaners, machine products and tools, may be "quickly washed in the Gray-Mills Cleaning System. Fully portable, the unit is equipped with a built-in gear pump. A safety cover provided is said to eliminate fire hazards. The Flo-Bac solvent is used cold and is said to degrease parts without pitting or corroding. Continuously filtered, the solvent may be used over and over again.

The Gray Mills Parts Cleaning System is available in two models; namely, a large model designated as the P70 and a smaller model designated as the P60.

Knu-Vise Model KL-450 "Vari-grip" Pliers

An improved pliers announced by Kn-Vise, Inc., 2201 Eighth St., Detroit 16, Mich., includes a feature that provides



Knu-Vise Model KL-450 "Vari-grip" Pliers

a self-setting pressure spindle to compensate for any variations encountered in the thicknesses of metal or parts clamped. Known as the Model KL-450 "Vari-grip," the pliers, according to the manufacturer, is especially designed to meet the unusual requirements of aircraft construction where the holding of skin or metal on airplane wings during riveting operations presents a problem.

The Knu-Vise Model KL-450 Vargrip Pliers, which may be used in holding work varying in thickness up to $\frac{1}{2}$ inch, is 8 inches long and weighs 22 oz. It has a throat capacity of from 0 to $\frac{3}{8}$ inch and throat depth of 2 $\frac{1}{2}$ inches.

MEASURING A PLUG GAGE with LIGHT WAVES

The formula is:

$$D = h + (.000012 \times N \times \frac{W}{W})$$

Substitute the actual values

$$D = .750 + (.000012 \times 3\frac{1}{2} \times \frac{1\frac{1}{8}''}{.125''})$$

and get the answer

$$D = .750168 \text{ inch.}$$

It's just that simple!

**Write for new, free Lightwave
Measurement Booklet.**



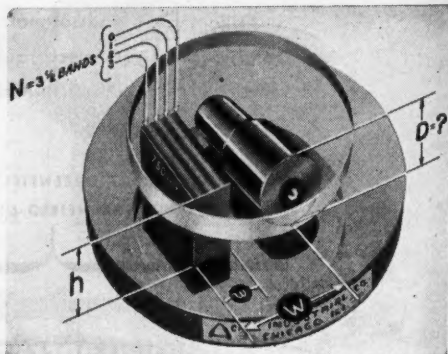
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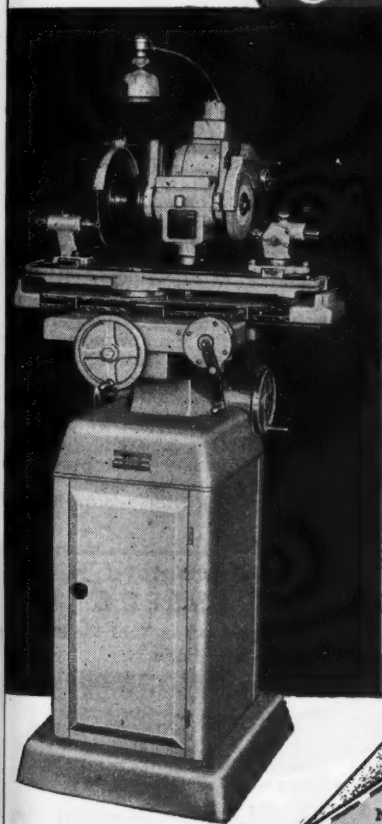
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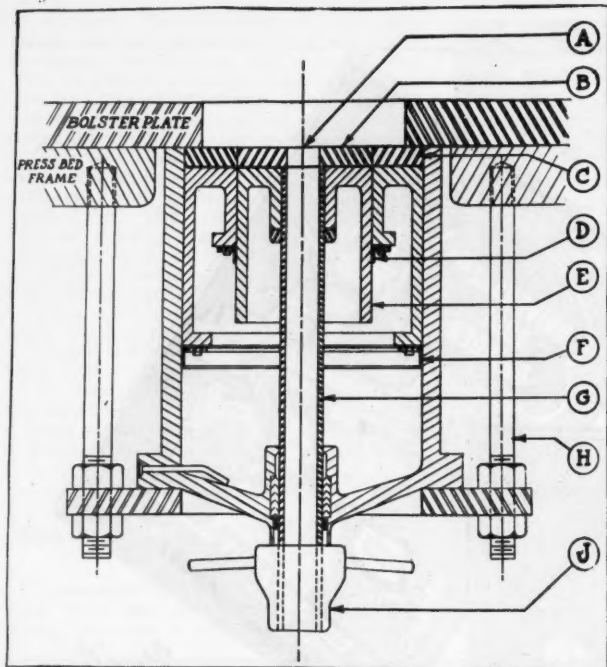


Diagram of Dayton Rogers Model DC Pneumatic Die Cushion Installation

in three sizes.

Referring to the accompanying illustration, the outer piston (B) has maximum diameters of 12, 14, and 16 inches. The inner piston (D) has a maximum diameter of 5 inches. The outside diameter of the inner piston can be increased or decreased for increasing or decreasing the draw ring holding pressure of the given compound die. The inner diameter of the outside piston can also be increased or decreased relative to the required draw ring holding pressure necessary on a given die, compensating for a constant air pressure on the pneumatic die cushion itself. The hollow stem (A) can be increased or

decreased to conform with the requirements of a given die, or can be eliminated entirely, making the piston stem (G) a solid shaft. The purpose of the hollow shaft (A) is to allow the slugs to drop through the entire cushion unit when needed.

The piston packings (D) and (F) are of standard design, and the length of the skirt (E) on the inner piston (D) can be increased or decreased to conform with the drawing requirement of

Dayton Rogers Model DC Pneumatic Die Cushion

Designated as the Model DC, a compound pneumatic die cushion which is designed to allow for the use of two independent blank holders or draw ring holding pressures on the same compound blanking, piercing, and drawing die is announced by the Dayton Rogers Manufacturing Co., 2849 S. 12th Ave., Minneapolis 7, Minn. The cushion is available

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CALDER DIAMOND DRESSERS

A COMPLETE LINE OF DRESSERS FOR EVERY GRINDING WHEEL.

Specialists on grinding wheel dressing for 47 years.

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DOUBLE-CUT

MILLED TOOTH

VIXEN FILES

**for many
years...**

HAVE GIVEN QUICK

**PERFORMANCE ON BOTH HARD AND
SOFT METALS AND OTHER MATERIALS**

Of a distinctive milled cut tooth design, this 14" Heller VIXEN Flat Double-Cut Milled Tooth File, No. 859, is particularly recommended for such soft metals and materials as babbitt, brass, bronze, copper, aluminum, lead, plastics and fiber. It has been widely used FOR MANY YEARS on hard and soft rubber and a metal pattern work.

As its name indicates, it is a double-cut milled tooth file. The rows of teeth are spaced wider toward one side of the file than they are toward the other. The result is the characteristic tooth design illustrated that en-

ables this special Heller VIXEN to cut both rapidly and smoothly.

No. 859 VIXEN works with a genuine shearing cut, inasmuch as no two successive teeth in any longitudinal row are in alignment. It produces a much smoother surface in cutting soft materials than is possible if the file teeth were to follow each other at regular intervals. Chattering is eliminated, and a more durable, long-lasting file is obtained.

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*America's Oldest File Manufacturers
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**CUTS
quick, deep,
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**• NO
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smooth finish**

**• NO
scratching**

**• NO
scrapping**



**GENUINE
HELLER**

VIXEN

**CURVED
TOOTH
FILES**

the given tool design. The die cushion unit is supported by four suspension rods (H) which are fastened to the press bed frame, or the cushion unit may be fastened directly to the punch press bolster plate.

The handwheel (J) provides an adjustment for stopping the inner piston (D) at a predetermined height, thus compensating for die sharpening and bolster plate thickness variation. This universal design is afforded primarily to meet compound cushion requirements on double and triple-action dies. It may, however, be used where conventional

type pneumatic die cushion equipment is needed for controlling the single draw ring by placing a special pin pressure pad over the area of the two pistons (B) and (D), locating same from the hollow piston stem (A).

The cushion cylinder is provided with a combination reducing regulator valve and pressure gage which automatically maintains a predetermined working pressure on the cushion cylinder unit. The unit may be removed from the punch press by removing the four nuts provided on the supporting rods (H).



NEAT STAMPING in NAME PLATES

Nameplate Detail Press

This machine quickly stamps details and serial numbers into name plates.

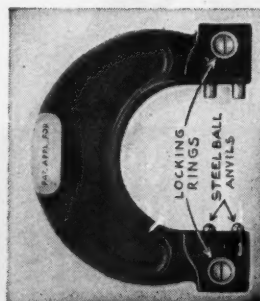
Write for Particulars

GEO. T. SCHMIDT, Inc.
1806 Belle Plaine Ave., Chicago 13, Ill.

Induction Heating Two-Station Hardening and Quench Table

A general purpose two-station hardening and quench table for use in connection with high-frequency induction heating generators is announced by Induction Heating Corp., 389 Lafayette St., New York 3, N. Y. Arranged with quick-change coil connections to allow for easy setting up, the table is designed to handle a wide variety of work and can be used as either a single purpose unit, using two identical fixtures, or as a general purpose table for various types of hardening operations. An initial timer provided enables the heating time to be recorded when a part is to be induction treated. After the initial heating time has been determined, the timer can be cut out by means of a selector switch included in the time assembly.

The table is also equipped with a master three-stage timer, located at the front, which automatically controls the heating and quenching periods of the cycle. A slight delay between the heating and quenching sequences may be included for the hardening of such parts



ADJUSTABLE SNAP GAGES IN STOCK Model A

Immediate delivery .025" to 7"

PROMPT DELIVERY ON PLUG GAGES .030" to 8"

Extraordinary Improvement in Adjustable Snap Gages with Ball-tipped anvil and amazing positive locking system cannot get out of set—Pat. Appl'd for.

GOOD GAGES Prevent Spillage Utilize Less Skilled Help
Speed-Up Operations Reduce Costs

EASTERN PRECISION GAGE CO.

318 BAYWAY

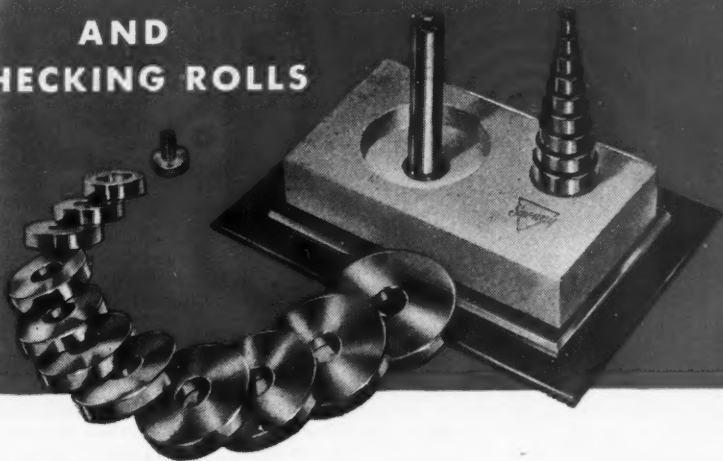
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New Micrometer Accuracy

WITH SAV-WAY MASTER SETTING AND CHECKING ROLLS



Every Mechanic Needs This Set

Every production man knows that precision tools and inspection devices are only as accurate as the methods and gages by which they are checked and set. When anvils are worn unevenly, flat gage blocks may not be adequate. This Sav-Way set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, and other types of gages under all conditions of wear. The set consists of 20 rolls, ranging from .100" to 2.000" diameter. Rolls are hardened, ground, and lapped to X gage tolerance. The set is housed in a modern, transparent, plastic case.

Sav-way INDUSTRIES
Products Division

BOX 117, HARPER STATION, DETROIT 13, MICHIGAN



A new micrometer instruction book full of valuable technical information will accompany each set.

CLIP THIS COUPON TO YOUR LETTERHEAD

SAV-WAY INDUSTRIES

Box 117, Harper Sta., Detroit 13, Mich.

Please send me illustrated literature on the Master Setting and Checking Rolls.

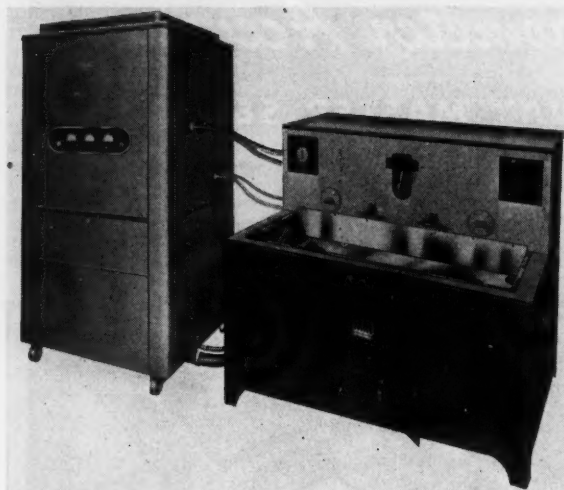
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MODERN MACHINE SHOP 281



Induction Heating Two-Station Hardening and Quench Table

duration of the quench is controlled by the master timer, which operates a solenoid valve.

The design of the hardening table includes a full-length sink and two large drains for carrying off the water. The sink is of sufficient size to adequately accommodate various types of fixtures, which are usually mounted directly on the base of the sink.

Two rotary-driven spindles are provided for use in connection with the hardening of parts such as gears where a slow rotary motion is re-

quired to assure uniform heating. The

spindle control includes a selector switch for each spindle so that rotation can be eliminated in such cases where it is not required. The table can also be ob-

that may require this type of treatment. Hose connections at the front of the panel permit water to be passed into rings surrounding the part being heated, thus providing a spray quench. The

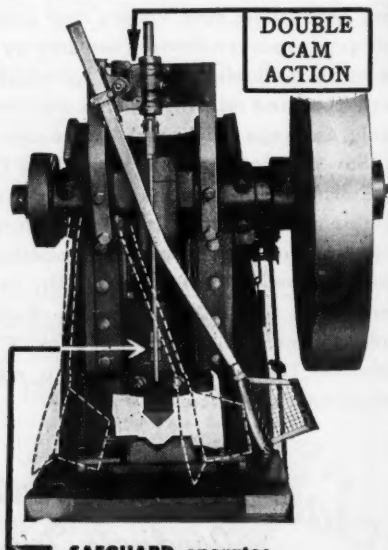
Stop Accidents... Increase Production with the Strand SWEEP SAFGUARD

With the Strand Sweep double cam action, you obtain proper sweep movement that prevents accidents.

Operation of Guard from press head provides additional safety in case of screw or other breakage.

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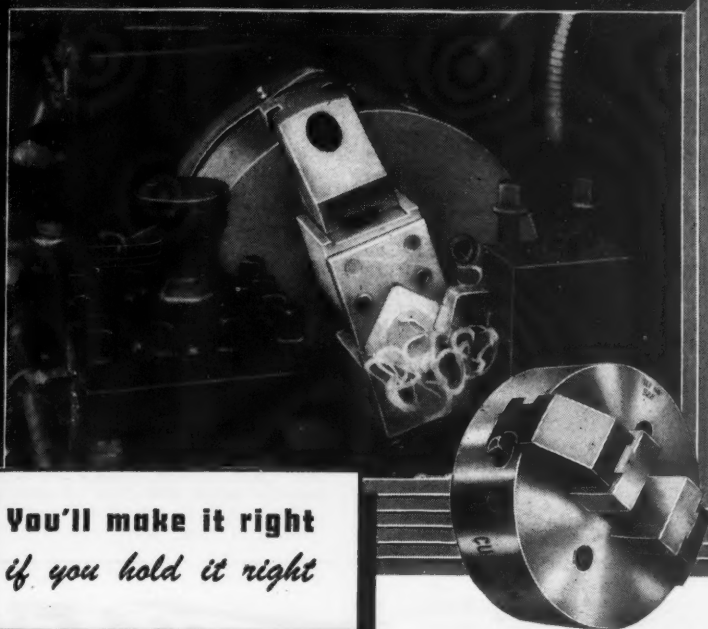
STRAND MFG. CO.
Safety Engineers
611 W. Lake St., Chicago 6, Ill.



SAFGUARD operates from head of press

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**You'll make it right
if you hold it right**

COOLING for the many unusual machine problems presented by ordnance parts production has emphasized the exceptional versatility of standard Cushman Chucks when equipped with two piece jaws and soft blank top jaws, or with slip jaws, as in the case of the chuck shown above. It is an easy matter to machine such jaws to efficiently and safely hold odd shaped work pieces. When the nature of the work to be handled changes, it is only necessary to change the top jaws or slip jaws for the new piece. In many cases such a procedure saves the time and cost involved in making special face plates, jigs or fixtures. Chuck bodies can be used for a wide variety of tooling set-ups.

If you have a work holding problem in your present production or are now planning tooling for future production, we suggest that you consult the Cushman Engineering Department. Write to The Cushman Chuck Co., Hartford 1, Conn., U.S.A.

A WORLD STANDARD FOR PRECISION



**CUSHMAN
CHUCKS**

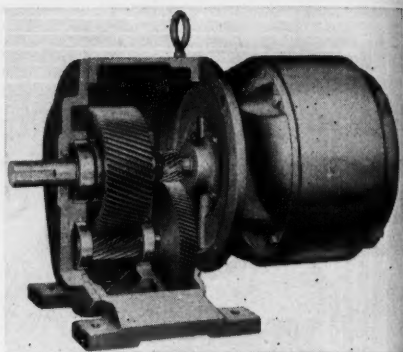
tained in a model in which work rotating spindles are omitted and another model only one spindle is provided.

The unit is furnished complete with a cover plate for the sink which, when applied, provides a flat-top table for use in brazing, soldering, and other metal-heating operations, in addition to hardening. A change-over switch located on the front panel is used to engage either work station. A signal-type pilot light provided is automatically turned on during the heating cycle. At the end of the cycle, the pilot light automatically turns off, indicating that the cycle has been completed.

The Induction Heating Two-Station Hardening and Quench Table is said to be well suited to the selective hardening of a wide variety of machine parts and may be equipped with fixtures of different types as used for progressive hardening of shafts and screws, as well as indexing and rotary type fixtures.

Cullman Speed Reducer

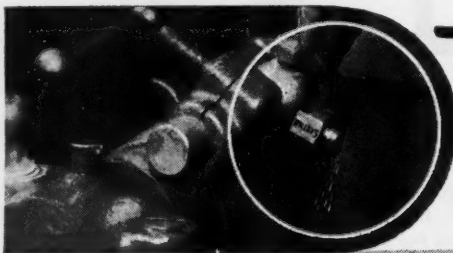
The Cullman Wheel Co., 1352-V Altgeld St., Chicago 14, Ill., announces the addition of a new type of speed reducer



Cullman Speed Reducer

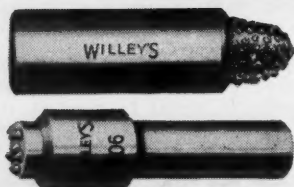
to its present line of machine tool drives and speed reducers. The unit is available in sizes from $\frac{1}{2}$ to 10 h.p. and in single and double types with ratios up to 5:1 and 20:1 respectively. The reducer can be furnished with either a 1200 or 1800 r.p.m. motor, thus affording an unusually large selection of speeds.

The new type speed reducer is streamlined and compactly and sturdily con-



WILLEY'S DIAMOND TOOLS

Complete lines of diamond cutting tools and diamond and mechanical wheel dressers. Ask for catalog 41.



WILLEY'S TUNGSTEN CARBIDE TOOLS

Standard cutting tools, blanks, and special tools, gages, centers, centerless grinder rests, using WILLEY'S METAL. Fully described in big new catalog 27. Write today.

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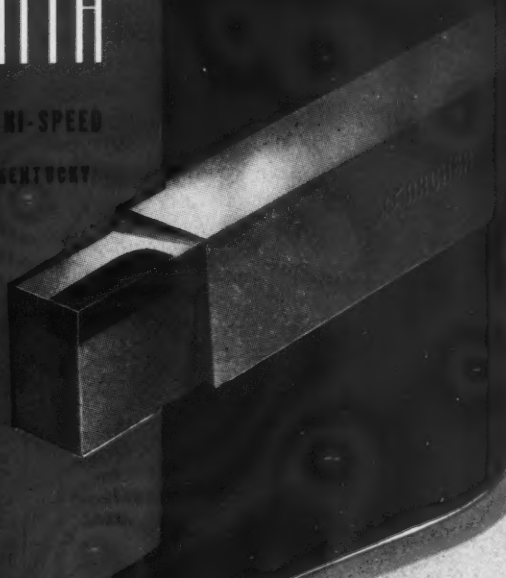
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CARBIDE *Cutting Tools* HI-SPEED

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With every modern facility for precision production on small and big jobs—standard or special—Carbide or Hi-Speed—with the "know how" bond of years of experience—with a reputation for service and attention to details, Archer & Smith invites your inquiry — and pledges action. Write for catalog. Send blueprints.



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125 NORTH EASTERN AVE.
LEXINGTON 34, KENTUCKY

Please send latest Cutting Tool catalog. ☐ Blueprints of special tools we require are enclosed; or ☐ mailed under separate cover.

Name.....Title.....

Firm Name.....

Address.....

City.....State.....

NUMBERALL

NAME PLATE DETAIL PRESS • MODEL 40

For stamping details on name plates. Eliminates irregular and unsightly stamping on name plates, tags, etc. Available in 1/16", 3/32", 1/8", 5/32" size characters. Dials contain all the letters and figures, diagonal line, and sign, dash, period. No experienced operator required. Steel, zinc, brass, fiber, etc., can be indented with a name or number. Press also furnished for hot stamping on plastics. Carriage Table advances one space with each impression of the Dial, like a typewriter, doing rapid work, even spacing and perfect alignment.



Model 40

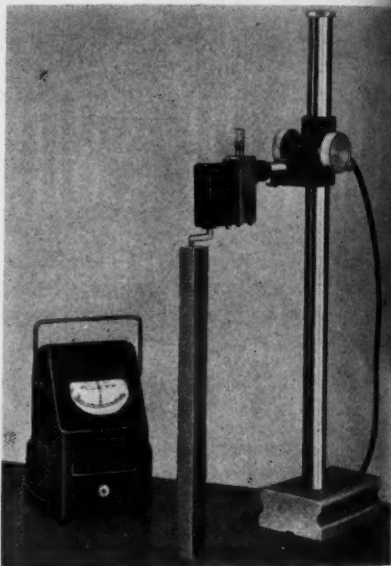
We also make numbering machines . . . automatic and non-automatic . . . for stamping, either hot or cold, numbers and letters into various materials.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

structed. The helical pinions and gears of the unit are supported on ball-bearings and are designed to take a liberal overload. All moving parts are totally enclosed in an oil-tight housing.

Sheffield Electrigrage Precision Height Indicator

Designed for use on a surface plate, a precision height indicator with Electrigrage which is said to provide quick,



Sheffield Electrigrage Precision Height Indicator

positive, and accurate readings are announced by The Sheffield Corp., Dayton 1, Ohio. The instrument comprises a surface plate block; a 26-inch column with rack; a Sheffield Electrigrage with 1,000-to-1 amplification (smallest graduation, 0.0001 inch); and an electric pickup head which is mounted on an adjustable extension arm. The design of the instrument also includes a micrometer for 3/32-inch vertical adjustment of the pickup head.

The mounting bracket for the pickup head is adjustable vertically from 0 to 18 inches. The extension arm can be

and gear
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totally

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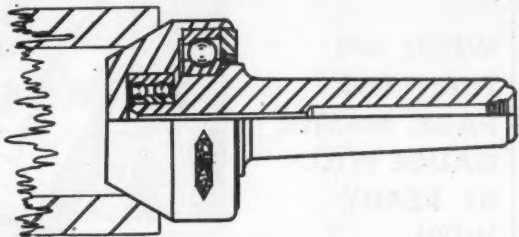
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LIVE CENTER *adapted to Tube Turning*

The basic design of the STURDIMATIC Live Center is ideally adapted to tube turning . . . extra large sections are no problem with this set-up . . . in most of these cases (see mechanical drawing) there is a tool clearance . . . Characteristic of all STURDIMATIC design is this low overhang which together with a slight cushioning action, that compensates for expansion, due to heat, shock and excessive thrust loads—reduces wear to a minimum . . . we will see that your job gets m-up with the right LIVE CENTER . . .



Special LIVE CENTER for turning extra large tubing.

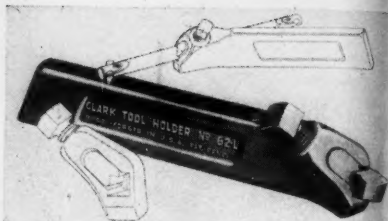
STANDARDS with Morse tapers (2 to 6) carried IN STOCK.

TOOL COMPANY

5222 THIRD AVENUE, DETROIT, MICHIGAN

STURDIMATIC LIVE CENTERS

adjusted so as to locate the gage point of the pickup head a distance of $4\frac{1}{2}$ to 11 inches from the edge of the column or $3\frac{1}{2}$ to 10 inches from the edge of the base. The pickup head can be rotated through a full 360 degrees and locked in any desired position. A fine adjustment knob facilitates the coarse and fine setting of the pickup head.



Clark Adjustable Toolholder

Clark Adjustable Toolholder

An adjustable toolholder with special vise grip jaw for use in lathes, shapers, and planers is announced by the Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif. The adjustable feature of the holder allows for the use of any of four or more sizes of tool bits in the same holder. Models available include a 15-deg. sloping cutter channel type and a horizontal or parallel channel type in both right and left-hand offsets. Each type is available in several shank sizes.

The special vise grip jaw of the Clark Toolholder has a unique clamping action for holding the bit vertically and horizontally with pressure evenly distributed over the entire holder channel, thus

preventing tool bit breakage. The design of the holder is said to completely eliminate the possibility of a pocket or sag developing in the bottom of the holder channel. In addition, the shape and position of the head of the holder afford operator unobstructed view of tool bit cutting edge.

The vise grip feature of the Clark Adjustable Toolholder is also said to provide for firm holding of very short tool bits. Square, round, out-of-round, undersize, or dual narrow bits for cutting-off or forming operations are claimed to be held equally rigid.

According to the manufacturer, the Clark Toolholder is especially suitable

**Prompt Delivery
on Thread Plug
Gauges.**

**WHEN WE
TURN THE
PAGE, MASTER
GAUGE WILL
BE READY
WITH**



GAUGES DIES JIGS FIXTURES

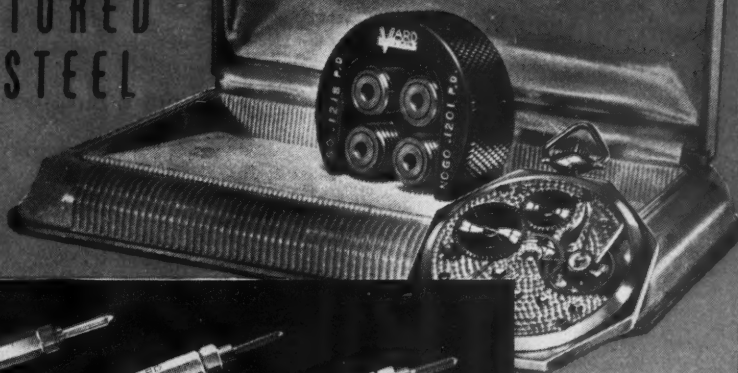
MASTER GAUGE CO.

2206 FENKELL AVE.

Phone: University 3-7676

DETROIT 21, MICH.

EXPERIENCE CAPTURED IN STEEL



Uniform, mass production of high precision parts is made possible by the use of simple yet extremely precise small hand gages. VARD makes these gages and carries in stock, ready for shipment on order, numbers of gage members and handles in standard sizes from 0-80 NF to 1½ in. NC. Cylindrical gages are always made to order. Tapered pipe thread plug gages in sizes 1/16-in. to 2-in. inside pipe diameter are carried in stock. The gages comply with specification AN-GGG-P-363.



VARD makes on order all types of cylindrical, taper and thread gages in standard or special thread forms.



VARD INC. 
PASADENA 8, CALIFORNIA

V stands for Verity • Accuracy • Responsibility • Durability



**FASTER
WELDS**

WITH

Balanced Polarity

Welding in tool and die shops or on any job of metal fabrication or repair is faster and easier with Marquette A.C. Arc Welders because with them there is never any confusion or delay about polarity.

With direct current equipment there is always a question . . . straight polarity and shallow penetration . . . or reverse polarity for extra penetration and better metal control.

Versatile Marquette machines, however, employ A.C. Current's outstanding welding characteristic of balanced polarity . . . assuring adequate penetration and perfect metal control, both at the same time.

**FOR SPEEDY, LOW COST Production of
TOOLS, DIES, JIGS and FIXTURES . . .
Buy the Best . . . Buy MARQUETTE.**

**LOW INITIAL COST —
LOW COST OPERATION
— NEGLIGIBLE UPKEEP
— NO "MAGNETIC
BLOW" — 10 MODELS,
125 TO 400 AMPS.**

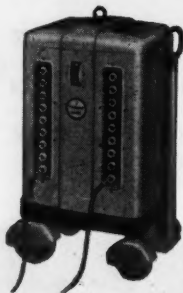
Send for free,
24 page, illustrated
booklet.

**MARQUETTE
MFG. CO., INC.**
Minneapolis 14,
Minn.

MARQUETTE

REGISTERED U.S. PAT. OFFICE

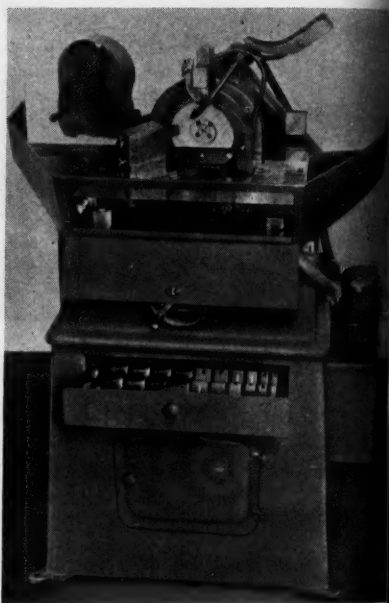
A.C. ARC WELDERS



for use with Stellite and other extra-hard cast alloy tool bits, due to the even distribution of pressure in the holder. The holder is drop forged of tool steel and heat treated and hardened for maximum resistance to wear, especially in the holder channel directly under the clamping device.

Norton Bura-way Grinder

The Norton Co., Worcester 6, Mass., announces the addition of a grinding machine designated as the Bura-way to



Norton Bura-way Grinder

its line of machine tools. The machine is designed to provide a quick and easy means for forming relief angles on metal-cutting tools.

Outstanding features and advantages claimed for the Norton Bura-way Grinder includes precise control in grinding tool angles; close control of the amount of metal removed in renewing cutting edges; precise reproduction of form tools within close dimensional limits; and the production of a fine surface finish at the edge of the tool.

BALANCE

ANY ROTATING PART



FROM 1/2 OUNCE TO 50 TONS

with **GISHOLT DYNETRIC.
BALANCING MACHINES***

The principle of Dynetric balancing may be used to locate, measure, and correct unbalanced forces in any part that rotates. It is the approved means of eliminating vibration to assure smoother operation, higher efficiency, and longer life. Literature on Gisholt Dynetric Balancing Machines is yours for the asking.

*A development of Westinghouse Research Laboratories.

GISHOLT MACHINE COMPANY

1219 East Washington Avenue • Madison, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements



BALANCING LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

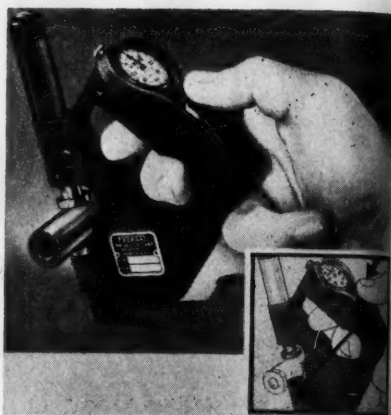
to afford increased production per grind and a clean-cut in operation. Relief angles are controllable within minutes of arc.

Equipped for wet grinding, the Norton Bura-way Grinder is said to be equally suited to the rough or finish grinding of high speed and cast-chromium cobalt steel as well as carbide-tipped tools.

Federal Model 1330 P-100 Visual Dial Indicator Snap Gage

Distribution of a visual dial indicator snap gage designated as the Model 1330 P-100 is announced by Federal Products Inc., 1144 Eddy St., Providence 1, R. I. A feature of the gage is the retractable anvil which is said to make the Model 1330 P-100 easy to apply and eliminate all excuses for marring the surfaces of highly finished workpieces. The anvil can be easily adjusted to any dimension within 1 inch and locked in place without lost motion.

The construction of the Federal Model 1330 P-100 Indicator Snap Gage is such that the weight of the gages and the in-



Federal Model 1330 P-100 Visual Dial Indicator Snap Gage

spector's hand rest upon the fixed or reference contact. The sensitive contact, movement of which is said to be transferred directly without error to the dial indicator, can be retracted by means of light thumb pressure. Both



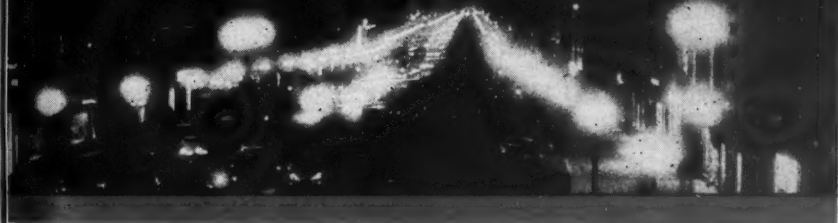
**Get More Production
from the Same Lathe...**
with *Colwell Turrets*

Specify the Turret with
the Built-In Cutting-Off Tool

- ★ Positive Indexing
- ★ Does Precision Work
- ★ 4 Tool Changes
- ★ Sizes for All Lathes
- ★ Sturdy Construction

S. G. COLWELL 25 Congress Ave. Prov. R. I.

**SPRAYIT
PRODUCTS
WILL MAKE
NEW HEADLINES**



THE return from war to peace production by *Sprayit* and *Elsco* will be News...*Headlines* will be made when our post-war products are announced.

These new and improved products will be the finest ever offered...They will have new and more appealing appearance...They will have increased efficiency...They will be manufactured from the finest basic materials, by highly skilled hands, in a most modern, mass production plant...They will have value beyond anything yet available.

Sprayit will offer an outstanding new line of spraying equipment, air compressors, spray guns, insecticide sprayers, air tools, sanders, and allied finishing equipment.

Elsco will produce a fine line of electric motors, generators, hydraulic cylinders, valves, pumps and controls for aircraft, automotive and other industrial applications.

Civilian production wheels will be set in motion just as soon as present restrictions permit. Meantime, our organization, while working for war, prepares for peace.



ELECTRIC SPRAYIT CO.

SHEBOYGAN, WISCONSIN



Electric Motors, Generators, Hydraulic Pumps, Valves, Cylinders, Air Tools, Spray Guns, Insecticide Sprayers, Sanders



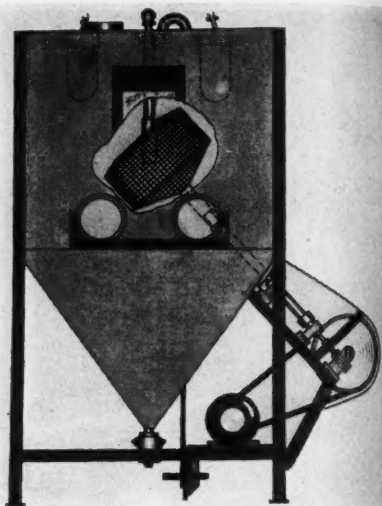
Paint Spraying Equipment, Air Compressors, Generators, Motors, Pumps, Valves, Cylinders, Hydraulic Pumps, Sanders

the fixed and sensitive contacts are made of hard wearing Norbide.

The Model 1330 P-100 gage is $\frac{5}{8}$ inch wide and is not over 6 inches at the longest point. It weighs 15 oz. and is designed to read in 0.001 inch.

Leiman Sandblast Machine

Applicable to metal, plastic, bakelite, and other products requiring smooth finishes, the Leiman Sandblast Machine illustrated herewith, product of Leiman Bros., Inc., 134-76 Christie St., Newark



Leiman Sandblast Machine

BRADFORD METALMASTER LATHES

14½" - 16½" - 18½" Swing

TOOLROOM AND ENGINE TYPES

.. Also ..

CAM FEED
UNIT TYPE
DRILLING AND
TAPPING
MACHINES



1840 - 1944

The Bradford Machine Tool Co.
Evans at 8th St. Cincinnati 4, Ohio

5, N. J., consists of a sandblast cabinet with stationery nozzle and a rotating basket. The latter is fitted inside the cabinet in such a way as to make it available for sandblasting quantities of small articles such as nuts, screws, and small gadgets of all types.

After being placed in the rotating basket, the parts to be cleaned are automatically tumbled over and over while being subjected to a sandblasting spray. In sandblasting large type workpieces, the basket may be removed from the cabinet. The basket is motor driven at the proper speed to make the sandblasting spray fully effective. The sand is fed through the nozzle over and over again from a reservoir at the



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{1}{8}$ " to 1" diameters. Send for price list.

HEIMANN MFG. CO.

330 Lincoln Ave.

Urbana, Ohio

Continuous, 16-Hour Shift Proves Easy for **CURTIS MODEL "C"** **AIR COMPRESSORS**

The Stewart Iron Works, Covington, Kentucky, operates two Curtis Compressors continuously for eight and sixteen-hour shifts against 100-lb. pressure service—supplying air to riveting guns, hammers, furnaces, and pneumatic tools.

Because of the completely satisfactory performance of their first Curtis Model "C" Air Compressor over a period of six years, the Stewart Company installed the second one to handle their increased demand for air . . . a tribute to the dependability and economy of Curtis Air Compressors for industrial uses.

Curtis (Timken Bearing Equipped) Compressors Offer:

- Large capacity per dollar of first cost
- High volumetric and mechanical efficiency
- Exceptional air delivery per unit of power input
- Low maintenance expense and oil consumption

For full information on the advantages of Curtis Model "C" Air Compressors, write for free booklet, "How Air Is Being Used in Your Industry."

CURTIS PNEUMATIC MACHINERY DIVISION

of Curtis Manufacturing Company

1913 Kienlen Avenue

St. Louis, Missouri



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TAPPING TIPS

From Woody Spencer's Notebook

Another Axis We've Got to Straighten Out



"An axis," says Webster, is a straight line, real or imaginary passing through any body, on which that body revolves." Of course, there's one big Axis we all know about. And you know the kind of a job we've done on that! But the axis that runs down through our taps and holes is something else. Not getting it licked is the cause of a lot of tapping troubles such as over size, bell-mouth holes and the like. But when we indicate that axis, true it up and keep it true, we get straight, sure holes and precision threads. Just like licking the Berlin-Tokyo Axis, it takes a little time but the results are well worth it.



These "Tapping Tips" of Woody Spencer, are by no means intended as technical advice. Their purpose is to pass along short-cuts, shop ideas and time savers we hope will smooth out some of the routine jobs.

For the real tapping problems that come up with almost every job, be sure to get definite technical suggestions. Send us complete details (material, diameter, lubricant, depth, etc., etc.). Our engineers will gladly send you specific recommendations.

*Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.

THE RIGHT TAP AT THE RIGHT TIME!

The Wood & Spencer Company
Cleveland 3, Ohio

bottom of the cabinet.

According to the manufacturer, the sandblasting action provided by the machine cleans metal surfaces of rust, scale, or other imperfections in preparation for electroplating, enameling, painting, and so on. The machine is also said to produce mat or satin finish effects on parts.



Lyon Steel Stools

Availability of steel stools for industrial production use is announced

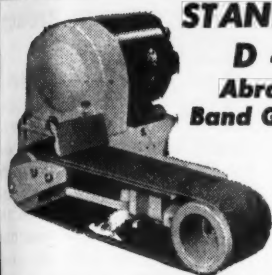
by Lyon Metal Products, Inc., Aurora, Ill. The stools are made in heights of 18, 20, 22, 24, 26, 28 and 30 inches and can be obtained with or without adjustable steel backs and with or without pressed wood seats. Steel glide feet are standard; casters are optional.

Lyon 26-Inch Steel Stool with Adjustable Back and Pressed Wood Seat

Delta-Milwaukee Bench Center

To meet the need for accurate and easily-operated inspection and testing devices, The Delta Manufacturing Co., 620 E. Vienna Ave., Milwaukee 1, Wis., has brought out the Delta-Milwaukee Bench Center illustrated herewith. Construction features of the unit include an indicator support bracket having a base that can be quickly and firmly locked in any position on the bed by merely operating a handle at the front of the bench center. The part which holds the indicator can be locked in any position—vertical or horizontal. Large, convenient clamp handles provided eliminate the need for pliers or wrenches in clamping the indicator on any other part in place.

The bed of the Delta-Milwaukee Bench Center comprises a heavy casting which is fully normalized to relieve strain. The top surface of the bed is flat, thus enabling the headstock and



STANDARD

D - 4

**Abrasive
Band Grinder**

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 1/4" band. The ideal portable unit.

**OTHER STYLES AND SIZES IN NEW
MANUAL ON FINISHING—WRITE TODAY**

WALLS SALES CORP.

96 Warren St., New York, N. Y.

WHITNEY MILLING CUTTERS

*for Uniform Seating of
Whitney Woodruff-type Keys*

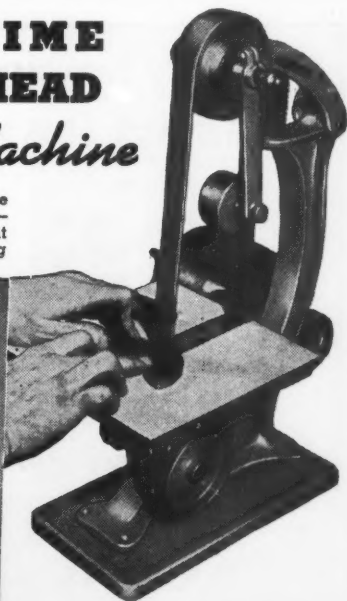


No need for skilled labor . . . or for filing and fitting . . . when Whitney Milling Cutters are used for seating Whitney Keys. Cutters are made in all sizes to correspond with the keys which can't roll over. Complete information in Catalog V-111. Write.

The Whitney Chain & Mfg. Co.
HARTFORD, CONNECTICUT

18 WAYS TO SAVE TIME & MONEY with the MEAD Industrial Burring Machine

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time" — install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for informative Money-saving circular now.



**MEAD
Specialties Co.**

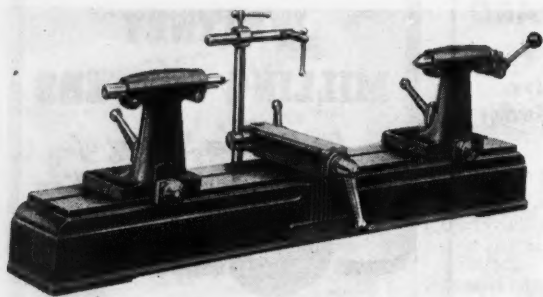
13 S. Market St.

Dept. 124-A

CHICAGO 6, ILL.

For METAL—PLASTIC—WOOD

MODERN MACHINE SHOP 297



Delta-Milwaukee Bench Center

tailstock to be reversed so that the unit may be operated from either side. The headstock and tailstock are identical castings and contain hardened and ground 60-deg. angle centers for holding the piece to be inspected.

The Delta-Milwaukee Bench Center has a maximum distance between centers of $19\frac{1}{2}$ inches. The overall length of the bed is 32 inches; the width, $5\frac{1}{2}$ inches. The dimensions of the ground bed are $4\frac{1}{2}$ x 30 inches.

Zagar Hydraulic Broaching Machine

The illustration herewith shows a hydraulic broaching machine for small parts which has been brought out by Zagar Tool Inc., 2388 Lakeland Blvd., Cleveland 17, Ohio. According to the manufacturer, the machine is designed to develop great and smooth pulling power without chatter. A built-in relief valve on the hydraulic pump allows for adjustment to provide a pull up

to 600 pounds.

The Zagar Hydraulic Broaching Machine is small, compact, and self-contained, and is provided with a maximum stroke of 20 inches. The unit is designed to accommodate broaches up to $1\frac{3}{4}$ inches in diameter, either key threaded, or grooved type. The cutting speed of the machine is variable, the set rate being 30 inches per minute.

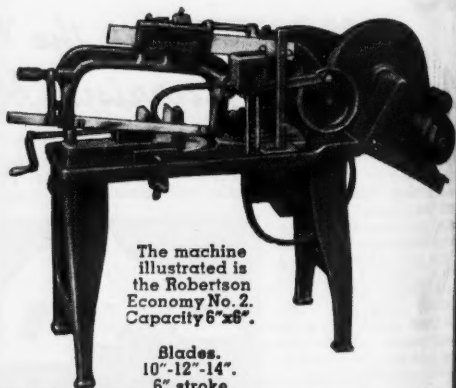
The Zagar Hydraulic Broaching Machine occupies a floor space of 2 x

Robertson's ECONOMY Power Hack Saws

FEATURES

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| Rugged Simplicity | Long Life |
| Hairline Accuracy | High Speed |
| Long Blade Life | Large Bearings |
| Few Adjustments | |
| Hydraulic Lift on Back Stroke | |

Write for information and delivery dates.



The machine illustrated is the Robertson Economy No. 2. Capacity 6"x8".

Blades.
10"-12"-14".
6" stroke.

There is a ROBERTSON ECONOMY SAW for every cutting job

W. ROBERTSON

MACHINE & FOUNDRY CO., INC.

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STANDARD



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HEADS

FIVE
TYPES

FIFTY-SIX
SIZES



Two Spindle Head
Both Spindles
Adjustable

United States Drill Head Co.
Cincinnati 4, Ohio

ROTARY FILES



HAND

CUT

CUT TIME

ALL SHAPES
Cuts & Sizes



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MECHANICAL DIE & TOOL CO. Inc.
11 New York Ave. Brooklyn, N. Y.

SEALED PROTECTION FOR FINE TAPS

Reiff & Nestor Taps now delivered to you sealed in a Moisture Proof, Shock-Resistant, Tough, Plastic jacket that gives the cutting edges the perfect protection fine tools deserve.

No more chipping in transit or injury from Tool Room handling.

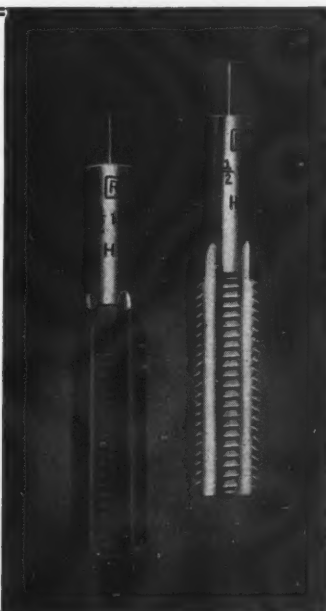
Reiff & Nestor Plastic jacket is easily removed and may be used again and again.

There is no extra charge for this Reiff & Nestor innovation.

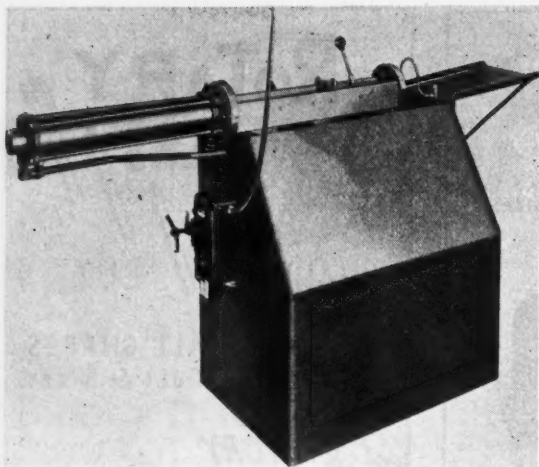


The new Reiff & Nestor Catalogue and Tapping Guide — just out. A request on your Letter Head brings it.

REIFF & NESTOR CO.
LYKENS, PENNA.



g job
C.
N. Y.



Zagar Hydraulic Broaching Machine

Powered by a 3 h. p., 220-volt, 3-phase, 60-cycle motor, the Zagar Hydraulic Broaching Machine has the following specifications: length of body, 36 inches; overall height, 42 inches; overall width, 24 inches; overall length, including cylinder, 63½ inches; pull, 6,000 lb.; weight, 1,250 lb.; shipping weight, 1,330 pounds.

feet and includes an 18-gallon oil tank with built-in Cuno oil filter. The cutting oil coolant system is of 3½-gallon capacity, is self-contained, and removable for cleaning. It operates on 110 volts.

use of a device known as the Newton Automat which is now being produced by the Newton Mfg. Co., 706 N. Heliotrope Drive, Los Angeles 27, Calif. The device is designed to actuate the cross slide, bed turret, and chuck of the

Newton Automat

Hand-operated turret-equipped bench lathes are said to be quickly converted into automatics through the

DEARBORN

Automatic

CHUCKING and INDEXING FIXTURES

For Fast Milling and Drilling

Model C was designed to meet the demand of faster machining and accurate indexing of small pieces on bench and hand milling machines.

SPECIFICATIONS:

| | Model B | Model C |
|------------------------------------------|----------|----------|
| Height to top of collet | 5¾" | 3¾" |
| Center of collet to back of fixture | 3¾" | 2" |
| Collet capacity | 1" round | ¾" round |
| Cuts per hour on free machining material | 1000 | 1500 |

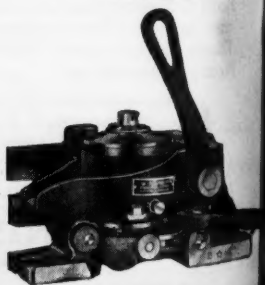
Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

WRITE FOR FOLDER.

J.W. DEARBORN ANSONIA, CONN.



MODEL C



MODEL B

AUTOM



CONTINUOUS HINGES

Manufactured by

**AUTO MOULDING
& MFG. CO.**

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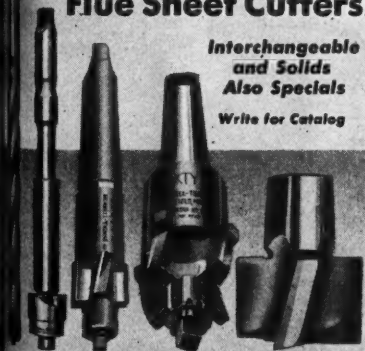
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CHICAGO 16

Counterbores High Speed Back Spot Facers Core Drills Flue Sheet Cutters

**Interchangeable
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Also Specials**

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GREENFIELD • MASSACHUSETTS

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Truck Over Immediately



No traffic interruptions when you patch broken concrete with durable **INSTANT-USE**. Material comes ready mixed. Simply shovel into hole, tamp and run traffic over immediately—without waiting. Bonds tight to old concrete. Makes smooth, solid, lasting patch. Withstands extreme loads. Keep a drum on hand for emergencies. Immediate shipment.



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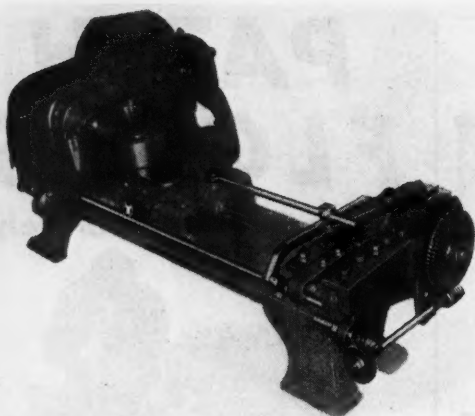
3615 Filbert St., Philadelphia 4, Pa.

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Company

Address



Newton Automat Installed on Bench Lathe

that cushions the shock of forming and cut-off operations and also assures uniform feed, accurate repeating, and long tool life. An automatic cut-out, which is quickly adjustable to work of different character, eliminates tool spoilage and part rejections, it is stated. The Scrader three-way valve provided will allow for operation of any pneumatic collet closer.

Installation of the Newton Automat can be easily effected. The unit is available for South Bend, Logan, Atlas, Craftsman, Sheldon, Clausing, and similar bench lathes.

lathe, eliminating all manual operations excepting the original setting up of the machine and the replacement of cutting tools, it is claimed.

Of simple but rugged construction, the Newton Automat includes a set of standard cams for adapting the unit to practically any job. The member which actuates the cross slide is a torque rod

Bliss 100-Ton Gap Frame Hydraulic Press

A 100-ton general purpose hydraulic press of gap frame design is now being introduced by the E. W. Bliss Co., 53rd St. and 2nd Ave., Brooklyn 32, N. Y.



WANT TO SAVE TIME?

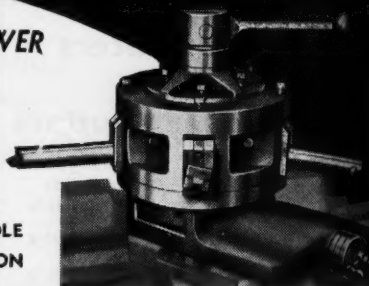
HERE IS THE ANSWER

Our NEW IMPROVED 5 STATION LATHE TURRETS

- 1 JUST A TURN AND A LIFT OF THE HANDLE BRINGS ONE OF FIVE TOOLS IN POSITION
- 2 THIS, WITH TEN ACCURATE INDEXED TOOL POSITIONS ALLOWED MINUTE ADJUSTMENTS

MADE UP IN FOUR INDIVIDUAL SIZES

FOR LATHES FROM 9" to 30" SWING



Time saved brings VICTORY that is nearer. Our NEW IMPROVED TURRET HEADS are built to take heavy cuts, and give precision service. Inexperienced men can quickly become fast operators with these NEW IMPROVED TURRET HEADS.



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112 CHARLES STREET,

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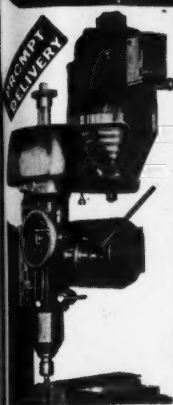
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MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations



EASY MOUNTING

LARGE QUILL—
4" TRAVEL

(counter balanced,
hardened, and ground)

6 SPEEDS,
250-3000 RPM.

Lever and Worm Feeds
1/2 H.P. Motor

Specially engineered by
RUSNOK to meet the de-
mand for heavier duty end
mill operations. Use s
many types of cutters on a
wide range of work. Large
size spindle (No. 9 B & S
taper). Takes 1/2" to 3/4"
end mills. Precision Engi-
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RUSNOK TOOL WORKS
1440 North Avenue, Chicago, Ill.

Automatic Metal Saw Grinder and Retooler

MODEL IC



PRECISION
and
ACCURACY
AUTOMATICALLY
ASSURED

For metal cutting
saws 2" to 14" in dia.
When specified, saws
as small as 1/4" dia.
and 1/2" to 2" spac-
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a Combination Grinder
for circular, band
and hack saws.

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The Wardwell Mfg. Co.
3166 Fulton Rd. Cleveland, Ohio

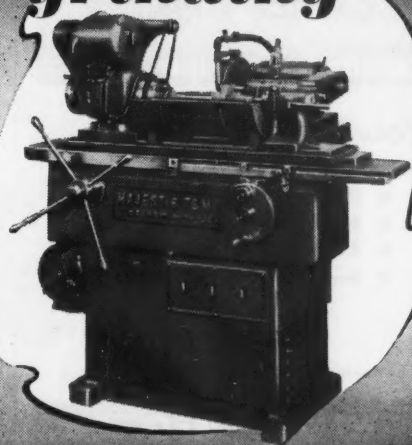
simplified grinding

with **PARKER-
MAJESTIC**
Internal and External
Grinders

For precision grinding . . . inter-
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of changeover guarantee maxi-
mum grinding output at low cost.

Send for descriptive circular..NOW!

Representatives in all principal cities

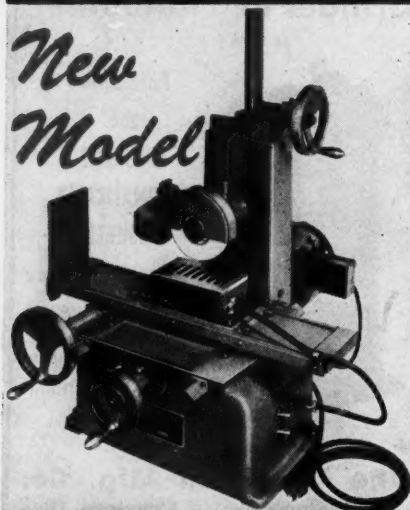


MAJESTIC TOOL & MFG. CO.

2950 EAST WOODBRIDGE • DETROIT 7, MICHIGAN

SANFORD

*New
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**HIGH SPEED
BENCH
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ACCURACY WITHIN .0001

New Features

- ★ Longer Stroke
- ★ Mehanite Castings
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Prompt Delivery

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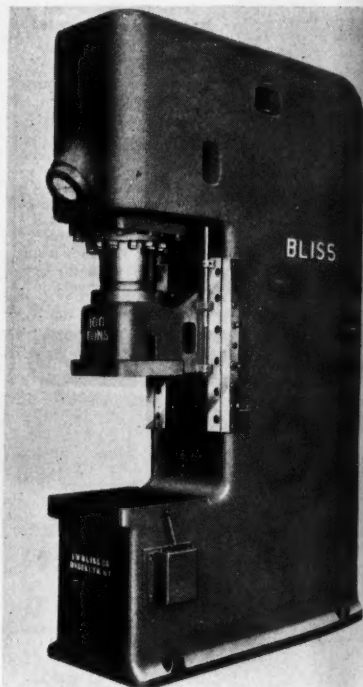
Available on M.R.O. Certifications

SANFORD MFG. CO.

**1279-81 SPRINGFIELD AVE.
IRVINGTON 11, NEW JERSEY**

Outstanding among the features of the machine is the combination of rugged frame construction and smooth enclosures. The slide is accurately guided by means of adjustable gibs.

The press is arranged for manual control, however, electric control for automatic reverse either by pressure or position is available. Various types of pumping units to meet different product requirements can be supplied.



Bliss 100-Ton Gap Frame Hydraulic Press

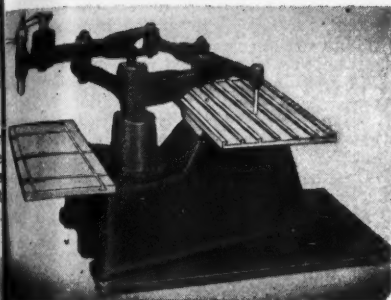
For small production, the pump is usually mounted in the frame of the press and for high speed production, the pump is mounted on top of the frame.

The press illustrated is one of a series ranging in capacities up to 500 tons. Modification of the bed and slide can be readily made for special purposes.

Specifications of the Bliss 100-Ton Gap Frame Hydraulic Press are as follows: bed area, 20 x 20 inches; distance center line of ram to throat, 15 inches; maximum stroke, 18 inches; over-

s of the
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DUPLICATING and PROFILING **AUTO - ENGRAVER**

Accurate Engraving with Unskilled Operators

Unskilled operators will profile or accurately reproduce in smooth lines any design, number, letter, emblem; on iron, brass, copper, aluminum, soft steels and all plastics. Here are some of its other uses . . . Drills a series of holes, or profiles small parts. • Cuts an even channel for wiring on panels. • Increases accuracy and production. • Works from original drawing or templates. • Etches glass and similar items. • Will not cause distortion. For information and prices write Dept. M.

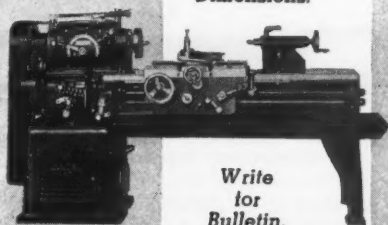
AUTO-ENGRAVER COMPANY

1776 Broadway, New York, N. Y.

CARROLL AND JAMIESON LATHES 15" AND 16"

12 Speed Geared
Head Motor Drive
Timken Mounted
Spindle.

Modern Design—
Liberal
Dimensions.



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THE CARROLL & JAMIESON MACHINE TOOL CO.

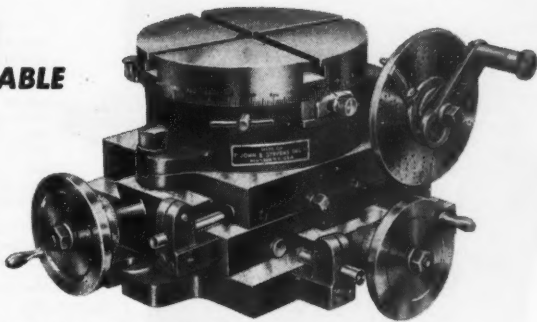
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No. 1 COMPOUND TABLE

shown with

7 1/2" ROTARY TABLE

MOUNTED



We Also Make

A No. 2 Size

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JOHN B. STEVENS INC.

482 CANAL STREET

NEW YORK 13, NEW YORK

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December, 1944

height, 145 inches; weight, 25,000 lb.; closing speed, 58 inches per minute; pressing speed, $8\frac{1}{2}$ inches per minute; opening speed, 54 inches per minute.

Woodworth Carboloy Gage with Segmented Shank

Long life, lightweight and excellent balance are outstanding features claimed for the Carboloy cylindrical plug gage



Woodworth Double-End Carboloy Cylindrical Plug Gage with Segmented Shanks

with segmented shank now being introduced by the N. A. Woodworth Co., 1300 E. Nine Mile Rd., Detroit 20, Mich. The gage is offered in sizes from 0.059 to 1.510 inches.

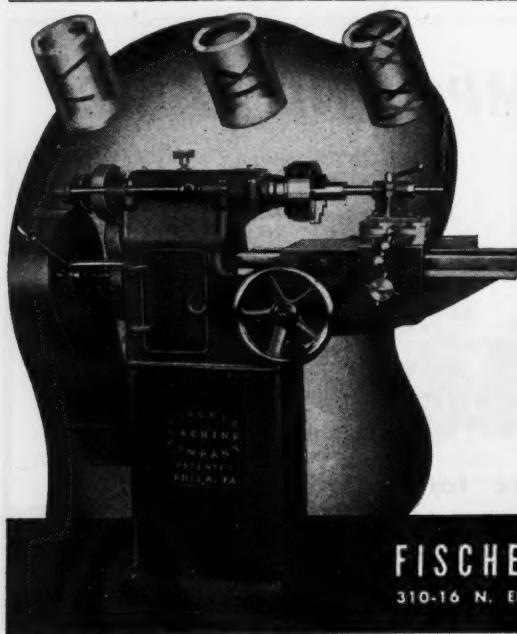
The shank segments of the gage, separated by slots, permit "breathing" and

allow for expansion or contraction resulting from temperature changes, with no distortion to the Carboloy gaging member it is claimed. Because of its unusually lightweight and excellent balance, the Woodworth Carboloy Gage is said to provide for reduction in operator fatigue, thus ensuring accurate inspection. In addition, the gage, it is claimed, is highly resistant to corrosion and will not rust.

A guide-guard cap of shockproof material, provides maximum protection to the Carboloy bushing-type member and also serves as a "pilot," thus enabling quick location of the gage in the work. The cap, which can be easily removed, permits the gage to be used for checking "blind" holes. The hollow bushing plus the slots in the shank automatically forms an air vent.

Zagar Collets and Collet Pads

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, announces the addition of collets and collet pads to its line of holding and indexing fixtures. Available are 5-C draw type and No. 2 W. & S. type, as well as No. 6 W.



FISCHER *Oil Groovers*

A wide variety of grooves may be cut on the "FISCHER" . . . with minimum set-up time and cost.

Bearing in which groove is to be cut is mounted on revolving chuck secured on work spindle. Boring tool is secured to carriage slide which has a reciprocating motion timed with work spindle and lined by crank gear and connecting rod.

Several attachments can be furnished for cutting practically any type of oil groove.

Capacity of No. 1 Machine—5" dia. . . . No. 2 Machine—15" dia.

Write for catalog.

FISCHER MACHINE CO.

310-16 N. ELEVENTH ST.

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IMPROVED BALANCING WAYS



four chilled iron discs rotate on special sensitive bearings. For balancing, straightening and trueing. Write for details.

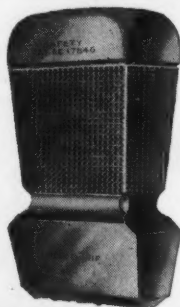
| Swing | 20" | 40" | 60" | 72" | 96" |
|-------------------------------------|-------|-------|-------|-------|--------|
| Greatest Distance Between Standards | 20" | 30" | 30" | 66" | 88" |
| Capacity in lbs. | 1,000 | 2,000 | 2,000 | 5,000 | 10,000 |

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Rockford, Ill.

SAFETY "WEDGE GRIP" STEEL HAND STAMPS



Pat. No.

2,089,794

Ideal for mass production markings of defense products . . . trade marks and symbols. Any size or number of characters available.

Write for Literature

MUNNINGS CO.
SAFETY STEEL STAMPS

158 Carson St., Pittsburgh 19, Pa.

A "MUST" against



Stop destructive dust and dirt from getting to your air driven tools—Use a Norgren Filter—Simple, compact and efficient.

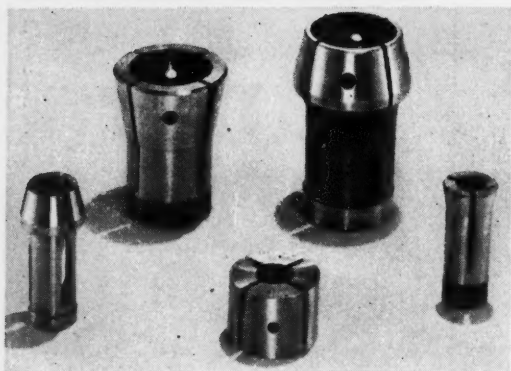
Double monel screen keeps out chips, dust, dirt—designed with baffle action to check moisture and oil emulsion.

Easy to clean, sludge and junk fall to the bottom—open the petcock—blow it out. To clean screen just unscrew top and lift screen out.

Write C. A. Norgren Co.,
220 Santa Fe, Denver 9, Colo.



Norgren



Zagar Collets and Collet Pads

& S. type master collets. All collets and pads for master collets can be furnished in round, hexagonal, or square shapes.

Zagar Collets are precision made, from first class steels, and are hardened and ground throughout. The 5-C draw collets are provided with ground threads to ensure accuracy.

Hill Model "B" Radius Grinding Fixture

The accompanying illustration shows the Model "B" radius grinding fixture for sharpening cutters which is now being marketed by the Hill Machine Co., 1032 Mulberry St., Rockford, Ill. The fixture, which is claimed to be easy to set up and operate, can be used in grinding 180-deg. or any smaller arc and certain angular or flat edges or surfaces.

As shown, the fixture includes a column which supports a horizontal spindle. On one end of the spindle is operating hand-wheel with disc and adjustable stops to limit the arc of swing.

On the other end is head with two micrometer-set adjustable cross slides which are located at right angles to each other. These slides allow for positioning the cutter so that the center of the tooth radius coincides with the center line of the fixture spindle. The outer slide includes an adapter plate onto which the work is clamped.

EXTRA STRENGTH Can Save Time and Labor

When three screws can do the work of four, five or more, they save drilling, tapping and assembling time and labor. They speed production and cut costs.

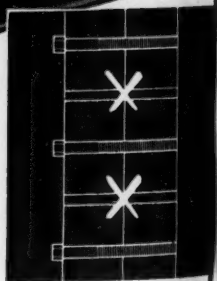
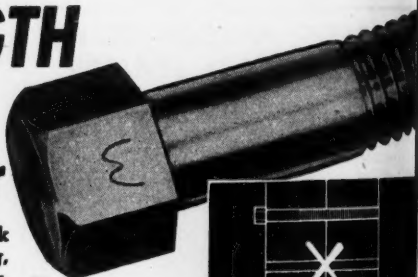
Mac-it Hexagon Head Cap Screws are heat-treated for maximum strength and toughness. This extra strength can be used to provide ample holding power with fewer screws.

The Mac-it "m" on the hex head is your guarantee of quality. It appears on all diameters 1/4" to 3/4", inclusive.

OTHER MAC-IT PRODUCTS INCLUDE:

Hexagon Socket Cap Screws, Hollow Set Screws
Hollow Pipe Plugs, Stripper Bolts
Square Head Set Screws

STRONG, CARLISLE & HAMMOND CO., Cleveland, O.



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Mac-it
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"MAC-IT"

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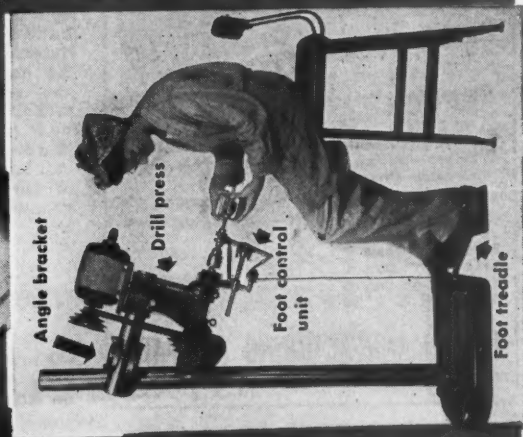
HERE'S HOW TO QUICKLY REMOVE THE BURRS LEFT BY CUTTING TOOLS AROUND THE EDGES OF HOLES ON MACHINED AND SHEET METAL PARTS!

DOUBLE EDGE
CUTTING BLADE



You can remove those sharp jagged burrs **FASTER** with NOBUR than by any other method! Simple and easy to use, NOBUR works like a drill — placed in the spindle of any machine tool, burring may be done by unskilled help with complete ease and safety — and as rapidly as parts can be handled. NOBUR eliminates slow, costly hand work. The double-edged cutting blade is of high speed steel and cuts freely in either alloy steels or soft metals.

Write for the complete story of burring this newest, faster way — NOW!



New Nobur foot control greatly speeds Nobur-ing! Quickly installed on any popular type of drill press, this inexpensive accessory leaves both hands for rapid handling of work. The mounting bracket provides adjustable positioning of spindle to operator's best working position.

NOBUR

BURR-REMOVING TOOL

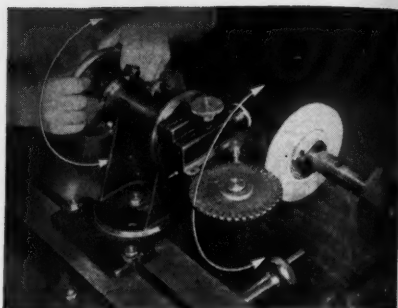
NOBUR MANUFACTURING COMPANY
107 North Orange Street, Los Angeles 26, California

MODERN MACHINE SHOP

309

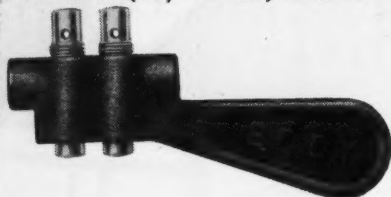
On the inner side of the head is a graduated scale and also a plunger for locking the adapter plate, when desired, in horizontal or in upper or lower vertical position. On the base, a graduated scale is provided for use in swinging the column for the desired back-off. The design of the unit also includes an adjustable spring stop for index plate. In addition, two fittings required for the initial setup are furnished—a diamond dresser and a gage for squaring up the first tooth face.

In using the Hill Model B Radius Grinding Fixture, the idea is to hold



Hill Model "B" Radius Grinding Fixture in Use

EDDY ADJUSTABLE INSIDE (GO, NO GO) GAGES



Replace:

—Plug Gages—Size Blocks—Telescoping Gages—Spring Calipers—Planer Gages—Keyway Gages.

Each gage is complete in a case with 12 rods of varying lengths to gage all sizes:

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|-----------------------------|---------|
| Between 1" and 2"..... | \$26.00 |
| Between 2" and 4"..... | 32.00 |
| Between 4" and 6"..... | 36.00 |
| Set of all 3, 1" to 6"..... | 85.00 |

EDDY MANUFACTURING COMPANY

321 PINE STREET

PAWTUCKET, R. I.

the cutter in such a way that it can be swung around the center of the arc of the tooth profile. The fixture is so designed that the operator can fix this center point on line which is an extension of the spindle axis. Each tooth of the cutter is ground by rotating the spindle of the fixture by means of the handwheel through the desired arc as determined by the position of the stops. As each tooth is ground, the table of the grinder is traversed to clear the wheel and the cutter indexed to the next tooth. Since the face of the wheel is dressed parallel to the table, the teeth can be ground at any position on the face of the wheel, thus avoiding wearing a groove in the wheel face.

Enco Model 6-S 6-Inch Square Turret Tool Post

Enco Mfg. Co., Dept. 58, 3321-23 Montrose Ave., Chicago 18, Ill., has placed on the market a 6-inch square turret



KUTMORE E ADJUSTABLE HIGH SPEED HOLLOW MILLS

16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery—even on specials. Write for Catalog No. 15.

CARL WIRTH & SON, 1625 Clinton Ave., N.

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DANLY PRECISION DOWEL PINS

STANDARD AND
.001 OVERSIZE

Hardness and Precision
ground to a tolerance of \pm
.0001 of an inch. Available
in .001 oversize for repair
or renewal work.

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**PRE WAR QUALITY!
QUICK DELIVERY ON
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TAPER
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BOXES**



A-S-E Stacking Boxes
Safe, Vertical Storage
of Small Parts.

All-Steel-Equip Company
800 John Street Aurora, Illinois



**Square Wire
Springs**



**Socket Stripper
Bolts**



**Steel Punch
Shanks**



**Socket Head
Cap Screws**



**Oval Wire
Springs**



Guide Pins



**Socket
Set Screw**



Die Makers' ACCESSORIES

Keep your tool crib stocked—Saves time and worry.
Phone any of following, for service — complete
stocks at these points:

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INDIANAPOLIS—Lincoln 1696

CLEVELAND—Express 1133
DAYTON—Taylor 5201
BUFFALO—Cleveland 1110
LOS ANGELES—Trinity 9827

Write for Catalog No. 9

THE PRODUCTO MACHINE CO.

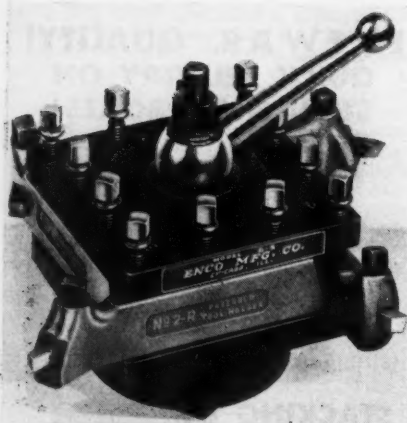
990 HOUSATONIC AVE.
BRIDGEPORT 1, CONN.



Dowel Pins



**Guide Pin
Bushing**



Enco Model 6-S 6-Inch Square Turret Tool Post

tool post for use on lathes with 16-inch or greater swings. The unit, which is designated as the Model 6-S, is of hardened steel construction throughout.

The center post which is approximately 5 inches in diameter, provides

for maximum rigidity under heavy cuts at high speeds with the larger tools. The turret block is designed to accommodate up to 1 1/4-inch tool bits or No. 2 toolholders for 3/8-inch square bits where additional flexibility in operation is required. The indexing mechanism being self-contained is said to eliminate all chip interference and to assure maintenance of an accurate setting in production.

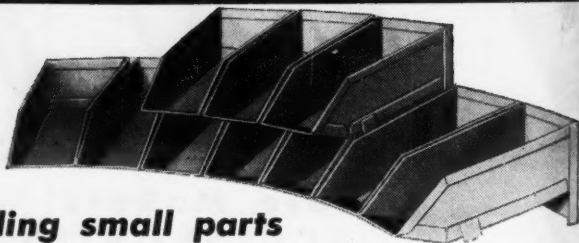
Mac-it tool post screws are standard features of the Model 6-S, which can be obtained with lower portion of base left machinable for quick adaptation to lathe. Tool posts with turrets made to specifications are also available.

Reimuller Hy-Speed Gap Style Motorized Press

All steel construction throughout and simple hydraulic control are outstanding features of the gap style motorized press which has been added to the line of Hy-Speed presses manufactured by Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Illinois.

Designed for production-line marking, forming, notching, pressing, broaching,

NEW BINS



for assembling small parts

Floors slope to feed parts to front—end reaching and fumbling.

Bins taper toward front to form convenient semi-circle—keep all bins within easy reach.

Nesting, locking construction for rigid set-ups, easily changed when necessary.

All-welded construction. Rolled, smooth edges.

Two sizes—tapered or straight edges. Heppers available for steady work.

Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa. Write Stackbin Corporation, 53 Troy St., Providence 1, R. I., for further details and low prices.

STACKBIN

"Stacked and



SYSTEM

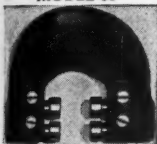
Still Accessible"

JOHNSON'S

Adjustable Limit SNAP GAGES



MODEL A



MODEL B



MODEL C

W. E. JOHNSON CO.

Keep down your gage costs by using these fast, accurate gages. Reset when necessary. Also: Flat and Cylindrical Plug Gages, Built-Up and Solid Snap Gages, Flush Pin and many other types of gages.

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Factory:
Turnpike and Pequannock
Avenue
Pequannock, N. J.

SMALL BUT MIGHTY WALTON BROKEN-TAP EXTRACTORS

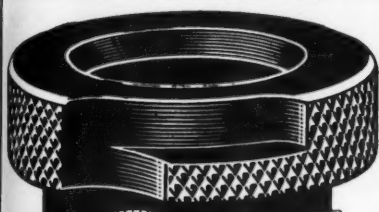


Yes, small in the amount of tool crib space they occupy, but a MIGHTY tool when put to the task of removing a broken tap. Walton Tap Extractors get at those broken taps and complete the job without loss of valuable time.

List Prices from \$1.50 to \$5.00 each.

Simple and easy to operate.
Immediate Delivery!

Write for Folder No. 10.



QUICK DELIVERY
Write for Specification
Sheets and Prices . . .
COLONIAL BUSHINGS, Inc.
145 Jos. Campau St., Detroit

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DRILL JIG BUSHINGS

The WALTON Company
94 ALLYN STREET · HARTFORD, CONN.

A TIME SAVER

YOU CAN EFFECT A SAVING OF 30 MINUTES TO SEVERAL HOURS by eliminating the time your Machinists must waste in getting together the proper Bolts, Washers, Clamps, Angle Plates, Parallel Strips, etc., for holding odd-shaped parts on the Drill Press, Miller, etc. The JACKSON TIME-SAVING VISE accomplishes this by means of its Revolving Turret Jaw and Supplementary Jaws which hold almost instantly the thousand and one shapes that arise in manufacturing and repair work. No other Vise is like the Jackson in design or accomplishment and the economies it effects will return its first cost to you in a few weeks of steady work.



FOUR SIDE REVOLVING JAW



THE DEEP JAWS HOLD WORK PERFECTLY VERTICAL



SUPPLEMENTARY JAWS HOLD IRREGULAR WORK



WORK HELD HIGH PREVENTS FALLING INTO BASE OF VISE

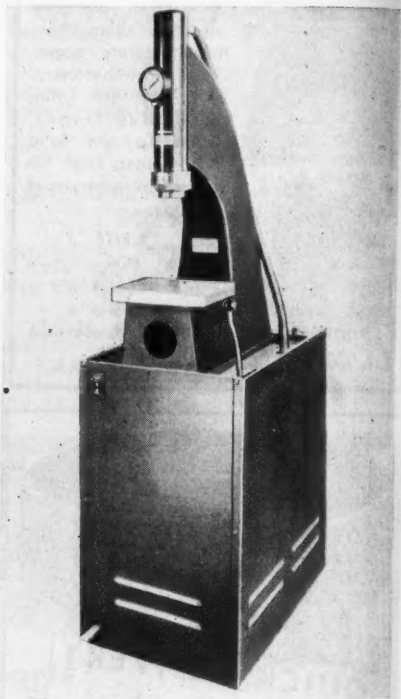
SEND FOR BULLETIN No. 23-M
DESCRIBING THE
JACKSON TIME-SAVING VISE

BROWN ENGINEERING CO.

120 N. THIRD ST. READING, PA.

assembling, and other operations, the press is made in two models of 10 and 20 tons with 10 per cent extra tonnage available. A hand lever hydraulic valve is used to control the ram movement through feed, hold or return position.

Additional features of the Reimuller Hy-Speed Gap Style Motorized Press include a hollow, large-area, lapped ram for holding punches and other tools and

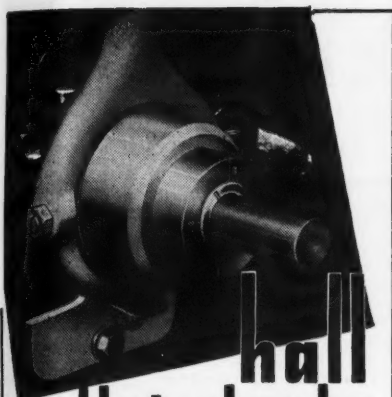


Reimuller Hy-Speed Gap Style Motorized Press

fixtures; packless design, and twin gages indicating pressure and tonnage. The ram has a maximum stroke of 12 inches. The motor-driven hydraulic pump furnishes $1\frac{1}{4}$ gallons of oil per minute to the ram, providing a 1.5-inch per second ram speed in the 10-ton model and 0.08-inch per second speed in the 20-ton model.

The 10-ton model provides four complete strokes per minute, while the 20-ton model provides two complete strokes per minute. Each model includes a 220-volt, 60-cycle, 3 h. p. motor as standard

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hall collet chucks

All grip—no slip . . . no bearings, friction, heat or lost power . . . push out type . . . full spindle capacity or over . . . automatic adjustment . . . work re-set without stopping lathe . . . 2 sizes, 1" and 2" capacities . . . order now with proper priorities.

Immediate deliveries.

HALL MANUFACTURING COMPANY
Ph. NO 9679

622 Tularosa Dr. Los Angeles 26, Cal.

SAVE TIME

IN SETTING BORING TOOLS ON RECONVERSION JOBS

Take one trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position with a trial cut.

USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

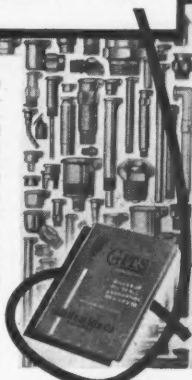
USEFUL FOR MANY OTHER JOBS

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.

WHAT IS YOUR LUBRICATING PROBLEM?

There's a Proved Answer Here

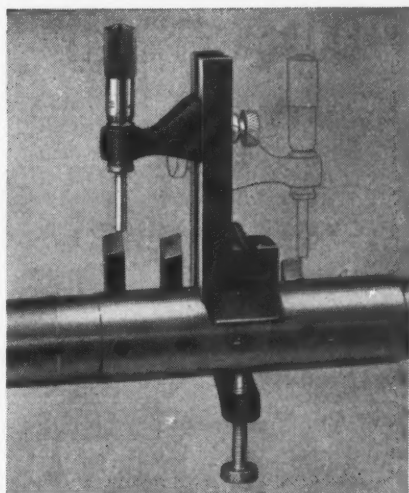
More than 35 years of engineering right answers to lubricating problems of every description has developed the present Gits Line of Oilers, Oil and Grease Seals and Lubricating Devices of unlimited descriptions. These 35 years of experience, plus the certification of dependability under all and extreme conditions, as afforded by war's strenuous demands, eliminates all guesswork for you where lubrication is a requisite. The Gits Catalog No. 60 gives you 172 pages of illustrations, diagrams, engineering data and valuable information. Send for your copy. If a special problem is at hand send your specifications for recommendations.



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December, 1944

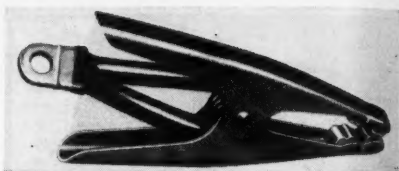
MODERN MACHINE SHOP 315

equipment. Flexible lines are used throughout, thus simplifying setting up.

The motor drive unit can be obtained separately equipped with a table top for use in testing hydraulic equipment, or as a hydraulic test bench, and furnishes up to 4,500 pounds per square inch pressure.

Lincoln Ground Clamp for Welders

The accompanying illustration shows a ground clamp for welders which has been brought out by The Lincoln Elec-



Lincoln Ground Clamp for Welders

tric Co., Cleveland 1, Ohio. The clamp is so designed that each jaw is connected individually to the ground cable; thus, if one jaw is prevented from making a good electrical contact due to heavy scale, paint, and so on, the other jaw will carry the current.

The Lincoln Ground Clamp includes a heavy duty processed steel frame with durable copper conductors and contacts. The clamp weighs $1\frac{1}{2}$ pounds, has a maximum jaw spread of $2\frac{1}{2}$ inches, and a rating of 300 amperes.



Cut Set-Up Time

75% through use of the
New Advance Clamps
(the only T-slot clamps)

Clamp directly over work. For use on all machines with T-slots. Standard and Heavy-Duty type.

Write for circulars.

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PEERLESS ABRASIVE BELT SURFACERS

For speed and quality in grinding flat surfaces of metal, wood, hard rubber, celluloid and plastics. Can be furnished in both vertical and horizontal type—9", 14", 20" sizes.

Other Horizontal and Vertical types for flat or round work can be furnished.

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"Radiform" Wheel and Tool Former

A radius and angle forming device to be known as the "Radiform" has been developed by the W. F. Meyers Co., Inc., 1014 Fourteenth St., Bedford, Ind. The device can be used to generate radii and angles tangent to radii on both straight and spiral fluted end mills, die-sinking tools, drills, reamers, and so on, directly against a grinding wheel without preforming the wheel.

The collet holder is quickly centered with a positive stop. Clearance angles are predetermined as are the radii and angles to be formed. The 24-notch indexing head built into the collet holder permits the forming of both primary and secondary clearances without

GEARS GOOD GEARS ONLY

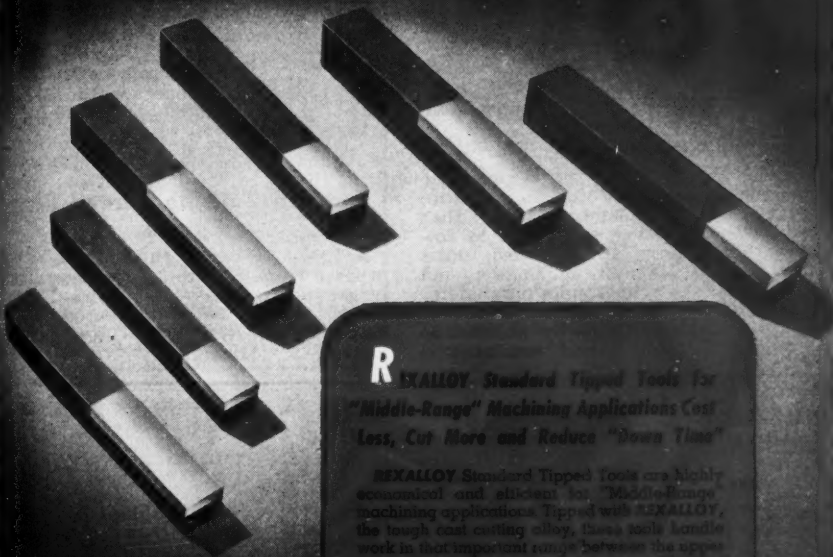
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STANDARD TOOL BITS • STANDARD TIPPED TOOLS • SPECIAL TOOLS-TIPPED AND SOLID • CASTINGS



REXALLOY TIPPED TOOLS LONG AND SHORT TIPS

REXALLOY Standard Tipped Tools for
"Middle-Range" Machining Applications Cost
Less, Cut More and Reduce "Down Time"

REXALLOY Standard Tipped Tools are highly economical and efficient for "Middle-Range" machining applications. Tipped with REXALLOY, the tough cast cutting alloy, these tools handle work in that important range between the upper limits of high speed steel and the lower limits of tungsten carbide. They cost less, of course, than solid cast cutting tool bits and are better able to stand excessive shock and unusual tool overhang. The high red-hardness of the REXALLOY tips permits easily more speed, feed or depth of cut, better quality of finished product, and much less "down time" because of longer cutting life between grinds.

Your nearest Crucible Branch will gladly arrange for a REXALLOY Service Engineer to demonstrate REXALLOY Standard Tipped Tools, which are available from stock competitively in your own plant. You stand to gain much by such a demonstration, so mail coupon today.

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☐ Please mail me your new 28-page book, "REXALLOY CUTTING TOOLS".

☐ We would like to discuss the possible use of REXALLOY in our plant.

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CRUCIBLE STEEL COMPANY

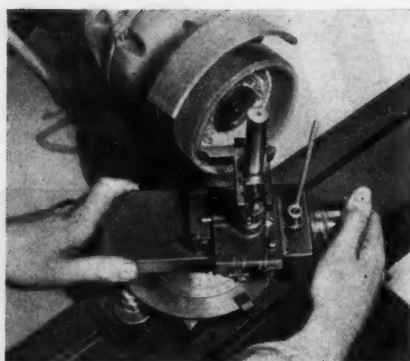


of America

Crucible Building, 405 Lexington Ave., New York 17, N. Y.
Branches, Warehouses and Distributors in Principal Cities

December, 1944

MODERN MACHINE SHOP 317



"Radiform" Wheel and Tool Former in Use

changing the setup of the device. The collet holder is connected to an arm, actuated by an adjustable cam so that radii and angles are generated to follow exactly any helix angled flute. Either spherical radii or smaller end radii are obtained by simple micrometer adjustment of the compound slide.

A swivel base with easily adjustable, positive stop control and vernier dial

reading is said to permit the formation of any degree and minute radii or radii with tangent angles. The positive stop control prevents undercutting and allows the operator to see the work being formed at all times.

The Radiform can be used to form concave or convex radii with angles tangent, or concave—convex blended radii, on tool bits, milling cutters, and so on. It can also be used to produce form wheels. Radii and angles on tool bits, milling cutters, and other tools having different front and side degree clearance angles are said to be formed and blended in one setup and operation with the fixture. No special skill is said to be required to operate the fixture, which can be mounted on different types of grinder tables.

Jansson Carbide Thread Plug Gages

A line of carbide thread plug gages in sizes from 0.112 to 3 inches, accurately ground to Class X or Class Y tolerances, is now being marketed by the Jansson Gage Co., 19214 Glendale Ave., Detroit 23, Michigan.

RUGGED! ACCURATE!

4 sizes

72"
90"
110"
134"



**ROGERS
"N.T."
KNIFE
GRINDER**

**GRIND YOUR
OWN KNIVES
and SHEAR BLADES**
Save time and speed
production!

This late model, cabinet-base Rogers Grinder grinds knives so they cut more keenly and last longer. Grinds on edge or face . . . any bevel . . . edge up or down . . . flat or concave. No skilled operator needed. Send for Circular N T; give length of knives.

Sam'l C. Rogers & Co.
213 Dutton Ave.
Buffalo 11, N. Y.

Also manufacturers of circular knife and band saw sharpening equipment.

ROGERS KNIFE GRINDERS
PRECISION QUALITY SINCE 1887

HAMILTON SWISS TYPE GEAR HOBBER

...for accuracy
and speed in
hobbing
PINIONS,
GEARS and
SECTORS.

TWO MODELS

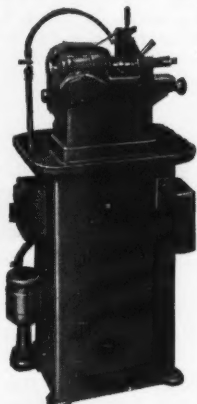
No. 00 SPUR GEAR
HOBBER (illustrated)
for work up to 2"
diameter.

No. 1 SPUR and
SPIRAL GEAR HOB-
BER for work up to
6" diameter.

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The HAMILTON TOOL Co.
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Permanently writes
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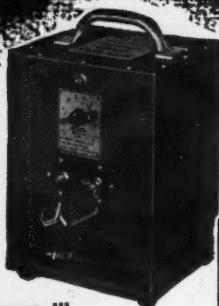
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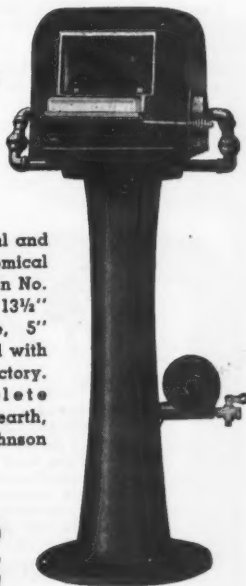


Johnson *Furnaces*

No. 120 High-Speed Steel Heat-Treating Furnace

A low cost furnace that is unexcelled for heat-
treating high-speed steels, for hardening dies,
punches, tools and small parts.

Reaches 1500° F.
in 5 minutes:
2300° F. in
30 minutes!



Compact, powerful and
remarkably economical
to operate, Johnson No.
120 has firebox 13½"
long, 7¾" wide, 5"
high heavily lined with
insulating refractory.
Equipped complete
with Carbofrax hearth,
G.E. Motor and Johnson
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ORDER TODAY!**

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of complete Johnson Line.

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Please send me free Johnson Catalog.

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Jansson Carbide Thread Plug Gage

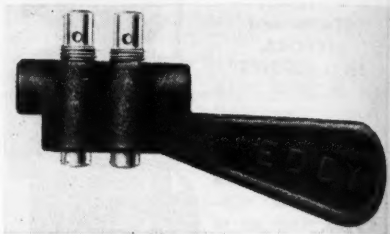
Made to American Gage Design standards, the gages are offered in three styles. Solid carbide is used for the smaller size gaging members. Larger size gaging members include carbide bushings over steel bodies. All gaging members are ground from solid carbide.

Eddy Adjustable Inside Gage

Designed to check the "go" and "no go" diameters of holes in one operation, the Eddy Adjustable Inside Gage illustrated herewith has been placed on the market by the Eddy Mfg. Co., 321 Pine St., Pawtucket, R. I. When the "no go" gaging rod and anvil come in contact with the rim of a hole, the "go" gaging rod and anvil are automatically lined up at right angles to the center

line of the hole, ensuring accuracy.

Rigidly constructed, the Eddy Adjustable Inside Gage can be quickly and easily set for each new gaging operation and can be sealed, if desired, for the larger production jobs. The gage may be used in checking the depth of keyways in holes, in setting planer and shaper tools and milling machine cut-



Eddy Adjustable Inside Gage

ters in gaging the taper and diameter of a tapered hole, and so on.

The Eddy Adjustable Inside Gage is available in 1-to-2-inch sizes with two anvils and two adjustable rods, and 2-to-4-inch and 4-to-6-inch sizes having four adjustable rods and no anvils.



**NO BUCKING
-NO BREAKING**

Saves Blades . . . Increases Production . . .

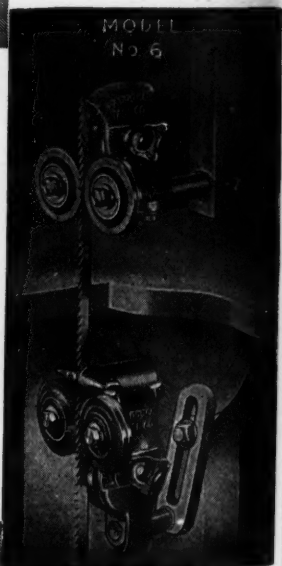
Cutting speed is gained by pushing against the saw blade. **PADDOCK BALL-BEARING BAND SAW GUIDES** enable workers to crowd work through . . . practically double efficiency of any band saw. Every point of support is a ball-bearing wheel running in same direction with saw. **PADDOCKS** are recommended for use in cutting all kinds of material. Remember—guide wheels are inter-changeable (you can balance wear by switching wheels). Write for full details and prices.

PADDOCK TOOL COMPANY

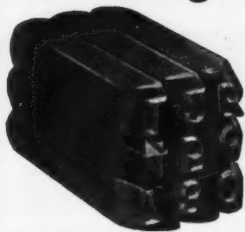
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Paddock
BALL-BEARING
BAND SAW GUIDES

Guided and Guarded by 6 Safety Points



Why THOR STAMPS Last Longer



... because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

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1. TRANSPORTS SKIDS
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New tubular construction makes
it light, easily handled—
and **STRONG**.

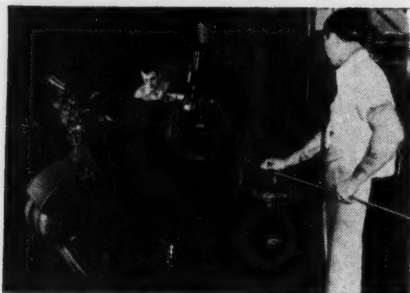
A FEW of ITS MANY USES:—

- Positions dies for easy, safe handling in and out of presses.
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- Positions work at proper heights for transfer.
- As a work table—always at proper height for each workman.
- Places and holds heavy work exactly where needed for machines.
- Loads and unloads motor truck shipments—level loading at truck or platform—transfers at places where overhead systems can't reach.

For the complete details of this adaptable, labor-saving, cost-cutting, truck, write today for Bulletin 136. It's free for the asking.

LYON-Raymond Corporation

Material Handling Equipment
393 Madison St., Greene, N. Y.



ACCURATE TUBING STARTS HERE

Dangerous errors in instrument readings can be caused by irregularities on the inside surface of tubing. Ace precision ground steel mandrels help keep this surface accurate in all kinds of glass, fibre, rubber, and plastic tubes.

RELY ON ACE FOR PRECISION GRINDING Centerless, Internal Cylindrical, External Cylindrical, Blanchard Surface, Plain Surface, and Thread Grinding.

PRODUCTION MACHINING Turning, milling, drilling, cutting, tapping, and threading of small machine parts that require precision grinding — on a mass-production basis.

METAL STAMPING Blanking, forming, and extruding of small metal parts on presses up to 75-ton capacity. Spot welding, sub-assemblies and assembly of intricate radio and machine parts.

HEAT TREATING Electric and gas furnaces, individually pyrometer controlled, for high-heat, quenching, and carburizing of parts up to approximately 10" x 10" x 15".

TOOL AND DIE WORK All operations for the production of Punches and Dies for small stampings, for Jigs, Fixtures, Gages, Moulds, Form Blocks, Tool Bits and Circular Form Cutters.

Send Blue Print, Sketch, or Sample to



ACE MANUFACTURING CORPORATION

for Precision Parts

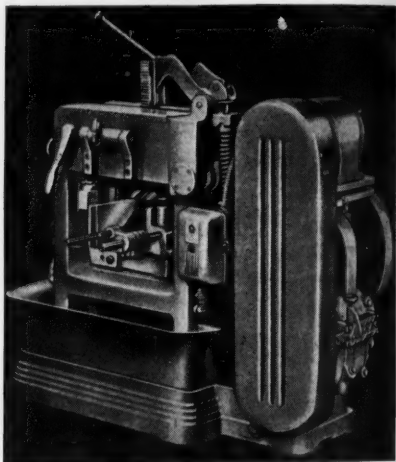


1235 E. ERIE AVENUE, PHILADELPHIA 24, PA.

Each size gage is furnished in a case complete with 12 gaging rods of varying lengths.

Peerless "Mechani-Cut" Metal Sawing Machine

To meet the need for a metal-cutting saw having full mechanical drive, four-sided saw-frame performance, and finger-tip control of the pressure feed, the Peerless Machine Co., 1600 Junction Ave., Racine, Wis., has brought out the



Peerless "Mechani-Cut" Metal Sawing Machine

Peerless "Mechani-Cut" Metal Sawing Machine illustrated herewith. Readily convertible to manually controlled conveyor operation, the machine is available in capacities of 7 x 7, 11 x 11, and 14 x 14 inches.

A feature of the Peerless Mechani-Cut Saw is the compensating feed unit. A highly sensitive rack and pinion feed compensates for hard spots in the work and varying shapes and types of stock. This feed unit is mounted out of the way of falling chips and coolant spray. Pressures are set by means of a finger-tip control and can be adjusted to a fraction of a pound.

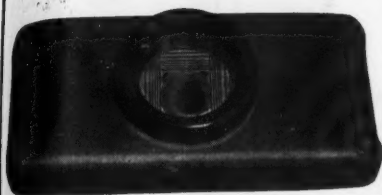
The massive four-sided saw frame surrounds the blade and the work and permits locating bearings above and below the saw blade. Hardened and ground renewable inserts take all strain and

a case
of vary-

etal

cutting
four-
and fin-
feed,
function
out the

"ALL-WAY" LEVEL



The FELL Precision Level is made to show the level of all ways at once. This eliminates disturbing the first level when leveling the second. Graduations are in .0005" per foot and form squares about a circular bubble, thus giving co-ordinate readings and showing direction and amount of slope, if any.

MADE IN TWO SIZES

5 1/2" x 12"

3 1/2" x 6"

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No waiting when you order Greaves Silent Bakelite Gears. • We have them in stock NOW! • Your order will go forward immediately. • You'll appreciate the silent operation and added smoothness provided by Greaves Silent Bakelite Gears. • You'll marvel at their great strength to carry big power loads... their remarkable ability to successfully operate completely submerged in water. • You'll welcome their low cost. • No metal reinforcements required. • Save Time... Money... Labor!

We also make silent gears of rawhide and Fabrilol.

Write for Circular.



FOR WORKSHOPS
CUTTING THEIR OWN
GEARS, WE CAN
MAKE IMMEDIATE
DELIVERY ON
BLANKS SAWED TO
SPECIFIED
DIAMETER AND FACE



THE *Greaves* MACHINE TOOL CO.

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Cincinnati, Ohio

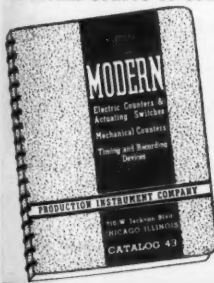
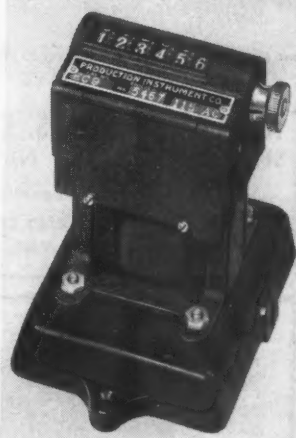


REMOTE Production Control

Wonderful opportunities to improve production control are opened up by Wizard Electric Counters. Wizards count anything that will actuate a switch, relay or photoelectric unit. They may be installed at any distance from the actual source of count. They can be centrally located

to give a continuous count on operations throughout the plant.

Complete Catalog on request. For suggestions, just tell us what you want to accomplish.



Production Instrument Company
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Manufacturers of Counting, Timing and Recording Devices

1944

December, 1944

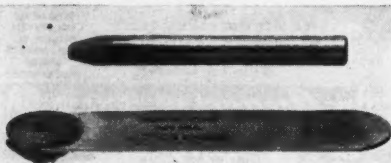
MODERN MACHINE SHOP 323

wear as the saw frame reciprocates, thus affording sustained cutting accuracy. A backing plate locked 1/32 inch above the saw blade provides added rigidity and permits the use of maximum cutting pressures.

Precleaner Unit for Model 600 "Dustkop" Dust Collectors

A precleaner unit for use in conjunction with Model 600 "Dustkop" Dust Collectors and having an unusually

'BURR-OFF'



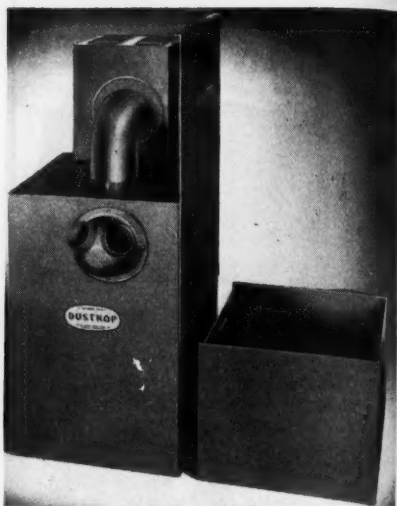
For Removing Burr or Chamfering Holes and Slots of Fork-Shaped Parts.

EFFICIENT • DURABLE • SIMPLE
INEXPENSIVE

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SEAFORD, NEW YORK

General Sales Agents:

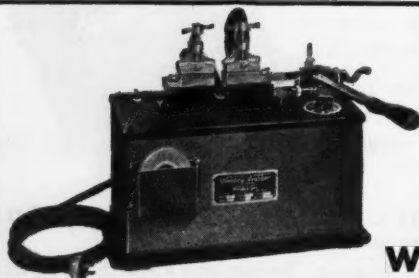
JOHN H. GRAHAM AND CO., INC.
105 Duane St., New York, N. Y.



Model 600 Dustkop Dust Collector Equipped with Precleaner Unit

large storage space for dust, dirt, shavings, and lint resulting from medium duty buffing, polishing, and similar operations is announced by the Agat-Detroit Co., 604 First National Bldg., Ann Arbor, Mich. The unit can be supplied complete with a Dustkop power unit as illustrated, or can be supplied separately for use with Model 600 Dustkops already in use.

Installation of the precleaner unit is said to be readily effected by merely connecting the inlet flange sleeve of the unit to the outlet of the dust source. The Dustkop is usually placed on top of the precleaner unit, and the connection between the unit and the Dustkop is completed with the sheet metal pipe



BAND SAW WELDERS

No. 141 may be had without grinder or with grinder for removing flash. Has 6 point heat control, one for annealing weld.

Welds saws 3/4" wide and smaller.

110 volt 60 cycle single phase. Can be made in 220 volt.

Send for catalog.

WELDEX INC.

7327 McDonald Ave.
DETROIT

25%



PATENT
PENDING



YOUNG MANDREL "ROLLER CLUTCH EXPANSION"

Boost your high production 25.%. This self contained unit requires no wrenches, "C" washers or power operated draw bars. Work locks automatically when placed on the mandrel. Work will not slip or jam. Young Mandrels require no adjustments.

Concentricity is maintained in LOW TENTHS for entire work length. Interchangeable sleeves reduce tool costs. No more obsolete mandrels.

Use Young Mandrels for grinding, turning, polishing, etc.

Quotations made from your detailed sketches of part and present mandrel. Good delivery schedules.

YOUNG ARBOR COMPANY

3257 Bradford Rd., Cleveland Heights 18, O.

LEACH External Grinder

PRICE
\$875.00
Fully Equipped

Grinds Work
from $\frac{3}{4}$ " to
11" in length
and from $\frac{1}{8}$ "
to 7" in diameter.

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necessary priority
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today for your
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C-F POSITIONERS

In Any Welding Operation It's "Position" That Counts

Production welding usually means working on top, bottom and on all sides of the weldment. It means a "quick change" of position should be possible for greater time saving, more efficiency, lower costs and greater safety to men and materials. With C-F positioners a welder can quickly position even the most cumbersome weldments at the press of a button, without crane help or handling crews. With just one set-up of the weldment, he can position it easily, speedily and safely, all alone. He can rotate it a full 360° at variable speeds from 0 R.P.M. up, tilt it to 135° beyond horizontal, and can weld, downhand, all side surfaces and angles in the one set-up with larger rods and fewer passes. All C-F positioner, both stationary and portable, are pedestal mounted to give maximum floor and working clearance and all are adjustable for height.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1311 S. Kilbourn Ave. Chicago 23, Ill.



furnished with the precleaner. The Dustkop may also be placed in any other location that is not too far removed for best operating efficiency.

The precleaner unit consists essentially of a cabinet containing a large, easily removable dust storage bin and cylindrical centrifugal separator, and is available with inlet flanges having single or double sleeves to connect with the dust source. Double sleeves are designed to fit standard 3-inch sheet metal pipe or flexible metal hose. The single sleeve 5-inch connection is recommended principally where a single source of a large volume of dust, lint, shavings, dirt, and so on, is involved.

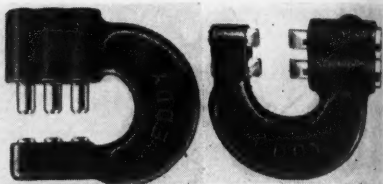
In operation, virtually all of the dirt, shavings, lint, and so on, drawn in from the source are separated out of the air stream by the precleaner unit. The precleaned air is then drawn through the multiple-blade fan in the Dustkop and returned to the working area after passing through a spun glass filter which forms the top of the Dustkop. The storage bin, which has a capacity in excess of 2 cubic feet, is sealed by a sliding panel which can be raised to permit access to the bin.

The precleaner unit, including backstand, occupies a floor space of 18 x 25

inches and measures 30 inches high less Dustkop.

Eddy Service and Thread Gages

Two additional types of gages—a service and an adjustable screw thread gage—are now being offered by the



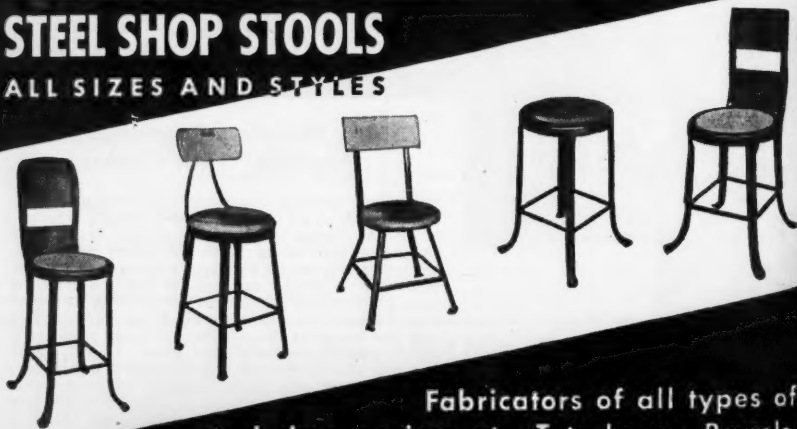
(Left) Eddy Style 23 Service Gage. (Right) Eddy Style 42 Adjustable Screw Thread Gage

Eddy Manufacturing Co., 321 Pine St., Pawtucket, Rhode Island.

The service gage is offered in two styles, a style 22 having two spindles and a Style 23 having three spindles for "go" and "no go" gaging. Each style is furnished in a case with a complete

STEEL SHOP STOOLS

ALL SIZES AND STYLES



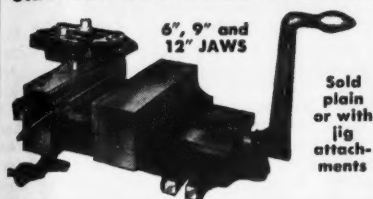
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Handles many special-holding jobs on many machines

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Keep your supply of lead hammers intact at all times. Remold badly damaged hammers quickly, easily, economically with the Johnson Mold & Ladle.

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set of gaging rods for work from 0 to 2 inches in diameter. Both styles include frames having extra long threaded holes which support the threaded gaging rods, thus ensuring strength and accuracy. The lengths of rods for each style gage are made in $\frac{1}{8}$ -inch steps.

The Eddy Screw Thread Gage is offered in five styles—three single side types with one, two, and three spindles respectively and two double side types with two and four spindles respectively. With the addition of two extra rods and anvils, the Eddy Thread Gage can be used in gaging all thread sizes

from 0 to $\frac{5}{8}$ -inch O. D. and all American Standard screw thread sizes from 10 to 32 threads per inch.

The gaging rods and anvils of the thread gage are arranged for swiveling, thus enabling them to be accurately set to the different angles of the various thread pitches. Each gaging rod has a thread diameter size adjustment, and is propelled by a hardened slotted screw and locked in position through an eccentric bushing by a soft metal shoe which is actuated by a hardened recessed screw. The eccentric bushing in which each gaging rod is housed offers an easy adjustment to compensate for any side wear on the rod or anvil.

The Eddy Screw Thread Gage is made of normalized iron, with the contact ends of the gaging rods and anvils hardened and ground. The recessed frame allows for easy handling of the gage.



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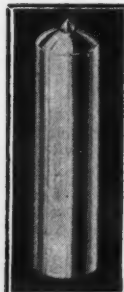
EAST SHORE MACH. PROD. CO.
DEPT. B, 835 EAST 140th STREET
CLEVELAND 10, OHIO, U. S. A.

Sav-A-Tool Method for Restoring Files

Files ordinarily discarded when old or worn may, it is claimed, now be completely restored to useful life by means of a unique renewal method developed by the Sav-A-Tool Corp., 3574 Eastern Ave., Cincinnati 26, Ohio.

Use of the method is said to affect in no way the original temper of the old file. With the method, all cutting edges on the worn file are carefully sharpened and all burrs are removed, resulting in an unusually smooth-cutting tool. In addition, the method provides for the anti-rust treatment and careful inspection of each file.

By means of the Save-A-Tool method, files can be restored as many as three times, it is stated.



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Price \$5.00 each
Set in $\frac{3}{8}$ Shank

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Standardized Die Sets, embodying many exclusive features, a listing of more than 195,000 stock sizes and 46 different styles afford a service that is unsurpassed.

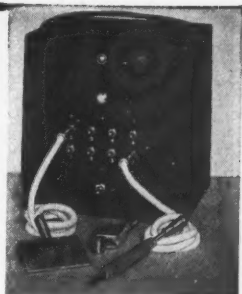
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Original Electric Etcher. 3000 in Daily Use Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly. • Three sizes to meet all requirements. • Also a combined Etchograph and Demagnetizer.

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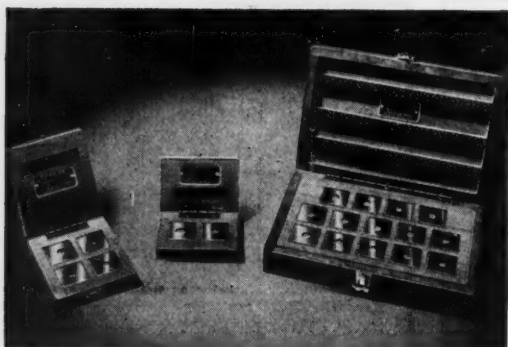
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SAVE TIME



In thousands of leading factories, machine shops, foundries, etc., Air-O-chek Air Guns are saving air, speeding production, reducing maintenance. There are many reasons. Simple construction. The exclusive ball and socket joint between valve and enclosed lever which gives full discharge with slight flex of hose. Instant, positive shut-offs. No outside levers or buttons. No packing gland. Just install a dozen Air-O-cheks and compare results.

AIR-WAY PUMP & EQUIP. CO., • 403 S. Jefferson St., • Chicago 7, Ill.



Hoke Type Carblox

faces, and greatly reduces wear by overcoming the tendency to wring the gage blocks together always in the one direction.

Hoke type Carblox are 0.000 inch square with 0.280-inch holes and are available in either "A" accuracy (0.000004 inch) or "B" accuracy (0.000008 inch) in sets of two 0.050 or 0.100-inch blocks, in sets of four blocks (two 0.050 and two 0.100-inch blocks), and in sets of 14 varied sizes. Special size Hoke

type Carblox can be furnished on order.

Hoke Type Carblox

Lincoln Park Industries, Inc., 1733 Ferris Ave., Lincoln Park 25, Mich., announces the addition of gage blocks of the Hoke (square) type to its line of Carblox cemented-carbide gages. According to the manufacturer, the blocks are practically non-magnetic and are highly resistant to rust, corrosion, and wear. Their square Hoke form allows the blocks to be easily handled, provides large symmetrical working sur-

Whitney Lever Type Hand Operated Punch

Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill., announces a lever type hand operated punch which combines the powerful geared action of the company's No. 4 angle iron shear and

SMITH MASTER PLATES

- ★ Exclusive Elliptical Reinforced Rib Design
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You can best meet the demands for greater accuracy in production inspection with Smith Master Surface Plates. Available in a wide range of sizes from 8x12 to 36x68 inches. Our deliveries are now being made promptly.

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ANGLE VISES



**DRILLING
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Solve Difficult Angle Jobs

"For Tool Room—Production Line—Bench."
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"Made in Sizes from 1 1/2" to 8" Jaws."
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This convenient, all-purpose surface temperature pyrometer is ideally suited to a variety of industrial plant needs. Accurate temperature readings are obtained in a few seconds, of plastics, liquids, oils, and similar materials, and of flat or curved, stationary or moving surfaces.

Built in several standard ranges, 0-300 deg. F., to 0-1200 deg. F. Write for Bulletin 3811 giving complete description.

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NEW

Angle Adaptor



Converts any drill press into a versatile multi-purpose machine.

Permits any spindle angle . . . at any height . . . horizontally or vertically.

Simplifies clumsy operations . . . speeds production . . . eliminates operator fatigue.

Makes burring, sanding, buffing, grinding, angle drilling, polishing, rotary filing, wire brushing, tapping, reaming, honing, etc., more convenient, twice as fast!

Adaptable to all drill presses with tubular columns . . . rigid construction . . . **POSITIVE LOCKING.** Write now for descriptive literature, details.

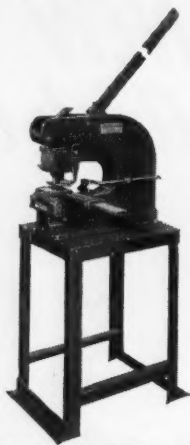
NOBUR MANUFACTURING CO.

910 North Orange Drive
Los Angeles 38, California

**Whitney Lever Type
Hand Operated Punch**

the versatility of its foot presses. The punch is made in four throat depths of 7, 10, 18, and 24 inches, and has a punching capacity of $\frac{1}{8}$ inch through $\frac{3}{8}$ -inch or $1\frac{1}{2}$ inches through $\frac{1}{8}$ -inch mild steel.

The Whitney Lever Type Hand Operated Punch is furnished complete with adapters and die shoes to accommodate punches and dies up to 2 inches round or $\frac{1}{2}$ inch squares.



Witco No. 673 Inhibitor

A rust preventive material for protection of metal parts and equipment during storage, shipment, and, in some

cases, in service has been developed by the Witco Chemical Co., 295 Madison Ave., New York 17, New York.

Known as Witco No. 673 Rust Inhibitor, the product is a cold-dip, rapid-drying coating that may be applied either by dipping or spraying since its viscosity is said to be comparable to that of water. According to the manufacturer, it fully conforms to Ordnance Specifications AS-673, Rev. 1, Amend. II, is non-abrasive, non-corrosive, and may be easily removed with ordinary solvents.

In addition, Witco No. 673 Rust Inhibitor features an extremely high melting point (in excess of 250 deg. F.) as well as flexibility at temperature of 20 deg. below zero. The material is supplied in standard 55-gallon steel drums.

**Bristol Free-Vane Electronic
Controller**

An electronic-type controller operating on the shielding effect of a vane passing between two coils in an electronic circuit has been announced by

MOTORIZED HOPPER UNITS

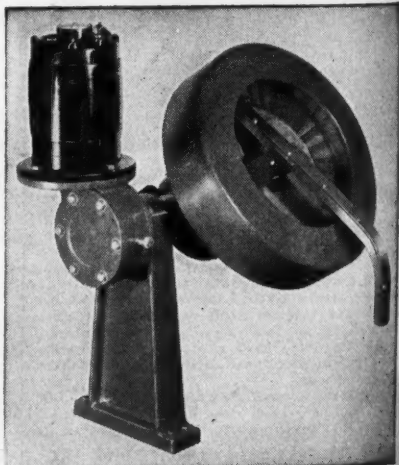
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FEED BULLET CORES,
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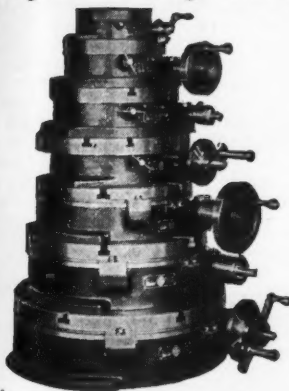
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Troyke Rotary Tables

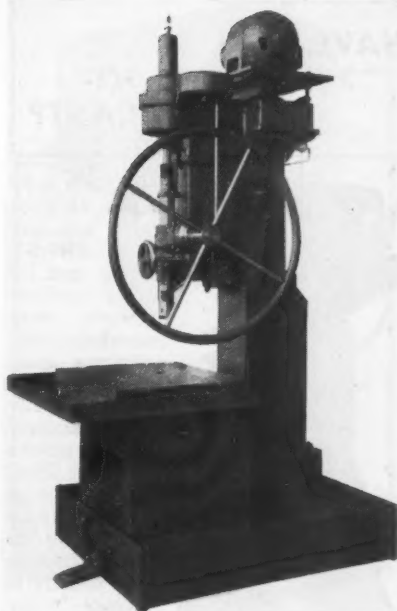


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422 Appleton St. Cincinnati, Ohio

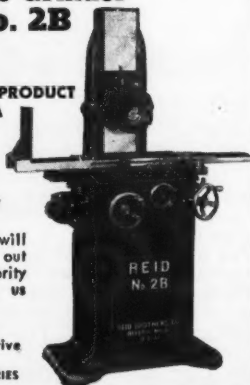


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Illustrating Baker No. 150 box
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BAKER BROTHERS, INC.

Toledo 10, Ohio

HAVE YOU 2 1/2 SQUARE FEET VACANT?



On 18 1/2 x 20 inches of floor space you can put a LINLEY Milling and Jig Boring machine to work... with remarkably high returns from your investment. It will speedily and accurately clean up the many small jobs that so often pile up awaiting an open machine... usually of excess capacity.

Dies, jigs, models, metal patterns, and the ever necessary milling, reaming and drilling operations can be handled efficiently because set-up and change-over are greatly simplified.

You have a choice of 8 speeds to 4250 r.p.m. and a micrometer measuring device to insure accuracy of machining.

A precision machine in every respect.

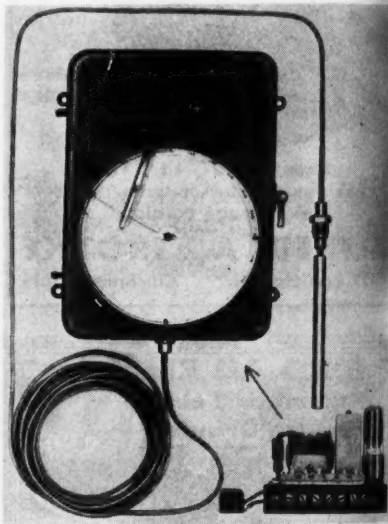
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LINLEY BROS. CO.

661 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

The Bristol Co., Waterbury 91, Conn. The controller is offered in recording and indicating models for automatic control of temperature, pressure, liquid level, and humidity. Available types of control operation include low-open, high-open, low-high, low-open-high, and low-normal-high.

The model for temperature control is offered in ranges from minus 125 deg. F. to plus 1,000 deg. F. for use in connection with motor and solenoid valves, relays, main line switches, and other fuel control apparatus for controlling



Bristol Free-Vane Electronic Controller

the temperature in electric, oil, gas-fired, and steam-heated ovens, dryers, oil baths, tanks, and similar industrial equipment.

The pressure model controller is available in ranges from full vacuum to 6,000 lb. per square inch and, in addition, is available for automatically controlling liquid level. The humidity controller operates from a wet and dry bulb type element with separate control for each bulb.

The Bristol Free-Vane Electrical Controller is also offered as a time-program controller for automatically controlling temperature, pressure, liquid level, or humidity according to a definite time schedule.

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WHEN EVERY SECOND COUNTS

"THE TOOLMAKERS
BEST FRIEND"



This small tool steel job was sawed on the Grob Open End Band Saw in record time. Die illustrated with four openings completed in 12½ minutes including change over from opening to opening.

Write for our catalog full of hints on saving many precious minutes and hours with the help of Grob's exclusive principle of Band Saw set-up.

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GRAFTON, WISCONSIN



FOOT
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**STREAMLINED
4-SPEED
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Complete with motor . . . 4" four-jaw universal machine tool chuck and foot control switch. Capacity from ¼" to 1½" reamers. Four speeds . . . 30—45—72 and 115 RPM. Higher speed ranges available. Eliminates handwork. Speeds production. Mail your order today. The new Greaves streamlined reamer-driver will come your way— *pronto!*

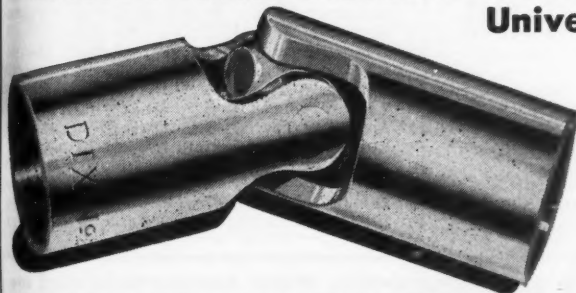


THE *Greaves* MACHINE TOOL CO.

2007-1 R. D. Eastern Ave.
Cincinnati, Ohio



"World's Finest Precision Ground Universal Joints"



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**PRECISION-
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Wherever perfect-functioning joints are required—Dix Precision-Made Universal Joints will give the utmost performance and satisfaction. Let Dix engineers help solve your problems.

DIX Universal Joints come in 15 standard sizes, from ¼" to 4" Hub Diameter made to Army, Navy, Air Corps spec. AN-40236 ready to install, or can be made to customer's specifications. Eliminate "rejects" with DIX Universal Joints! Write, wire for catalog, prices, specifications, etc.

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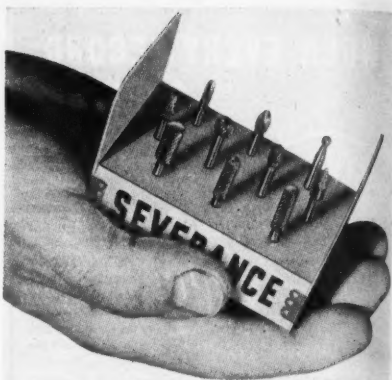
December, 1944

MODERN MACHINE SHOP 335

Severance 1/8-Inch Shank Midget Milling Cutters

Especially designed for the fine finishing of castings, patterns, and parts, midget milling cutters with 1/8-inch shanks have been added to the line of standard cutters offered by Severance Tool Industries, Inc., Saginaw, Mich.

Hardened and then ground from the solid, the cutters are said to cut sharp chips from the hardest metal or plastic. Due to their small size, the cutters are claimed to be ideal for finishing the most intricate patterns and parts.



Severance 1/8-Inch Shank Midget Milling Cutters

The Severance 1/8-inch Shank Midget Milling Cutters are available in 10 standard shapes—single or in sets of 10 in a convenient kit box.

Accuracy lasts longer with new J-83 Gage Block Set!



TWO wear blocks of tough tungsten carbide protect the surfaces of the 81 alloy steel blocks. That's why the Jansson J-83 set of precision gage blocks stays accurate longer. Makes 120,000 gages in steps of .0001" from .200" to over 12". Accuracy guaranteed to .000008", .000004", or .000002".

For precision gage blocks, calipers, height gages, sine bars, tri-squares, and special gages see Jansson, "The House of Precision," first. Write for additional information.

JANSSON GAGE COMPANY
19214 GLENDALE AVE., DETROIT 23, MICH.

Nichols-Morris "Bemisine"

Known as the "Bemisine," a time-saving device for setting or measuring any angle from 0 to 90-deg. to accuracy within one minute or arc has been announced by the Nichols-Morris Corporation, 50 Church St., New York, N. Y. According to the manufacturer, the device requires only a 2-inch capacity micrometer and reference to standard table of sines and cosines to determine and set any angle within its range in approximately one minute's time.

The Bemisine is a multi-purpose tool-room accessory in that it is designed for holding small workpieces for grinding, machining, and inspection opera-

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**5000 SHAPES AND SIZES
GROBET SWISS FILES**

Genuine Grobet Precision Swiss Files are world famous for utmost precision and durability since 1812. Learn more about these chrome steel files—send for Catalog KF, the most complete of its kind.

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ECLIPSE Seamless Flexible Metal Hose
Manufactured and Sold By



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H HARGRAVE Clamps

To obtain greater output, save time, perform work easier, requires the right clamp for every job. In design and construction, HARGRAVE Clamps have kept steady pace with production needs of industry. Write for catalog showing complete line of Clamps, Chisels, Punches, Washer Cutters, File Cleaners, etc.



THE CINCINNATI TOOL CO.

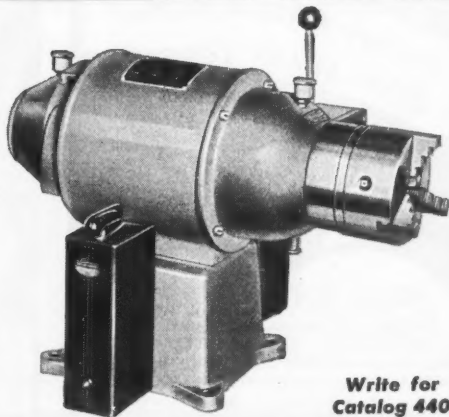
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The **CINCINNATI TOOL CO.**

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Ideal for polishing, de-burring, lapping, filing small metal and plastic parts — more quickly, more accurately, at lower cost! A size and type for every secondary finishing operation.

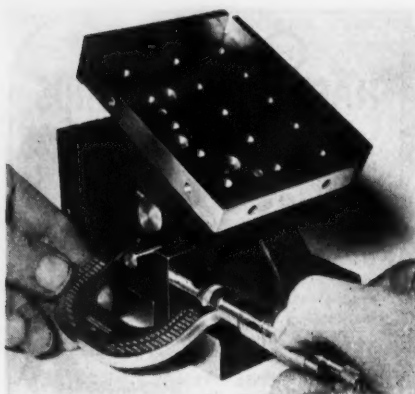


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Catalog 440

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2060-80 READING ROAD ... CINCINNATI 2, OHIO



AWARDED
October '42



Nichols-Morris "Bemisine"

tions. It is especially recommended for use with grinding and jig boring equipment where angular setups are usually difficult and time-consuming.

General construction is sturdy and simple, consisting of a precision ground right-angular base which supports an accurate, drilled and tapped work-hold-

ing table measuring $3\frac{1}{2} \times 4$ inches. The work table is pivotally mounted so that it can be tilted to any angle up to 45 deg. Angles in excess of 45 deg. are obtained by merely resting the Bemisine on the second side of its right-angular base and computing the complementary angle. Thus, with table set at an angle of 30 deg. with Bemisine in horizontal position, a table angle of 60 deg. is automatically provided when the device is tipped up at right angles to its original position.

The accompanying illustration shows 2-inch micrometer in position to measure over a hardened measuring pin and block. When the work table is perfectly level, the distance measured over pin and block is exactly 1 inch. As the table is tilted, the pin, which is an integral part of the table assembly, changes its distance from the block proportionately. Because of the 1-inch constant on both the Bemisine and any 2-inch micrometer, a reading taken over the pin and block at any point (minus the 1-inch constant) is the true sine reading of the included angle. Reference to table of sines and cosines is all that is necessary to determine any unknown angle or set a desired angle.

Standard gage blocks may also be

**CARBOLY-TIPPED SCRAPERS
STAY SHARP LONGER!**



HERE'S WHY!

Forthman Scrapers are tipped with **CARBOLY CEMENTED CARBIDE**—the hardest metal made by man. Holds keen cutting edge for hours instead of minutes of continuous use! Outwears as many as 10 ordinary steel scrapers! Provides finer finishes faster!

Furnished ground or unground. Write today for prices and specifications.

Manufactured by
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**WHIRLWIND
Pneumatic**

M·B BENCH GRINDER



MODEL H-S-R 55,000 RPM

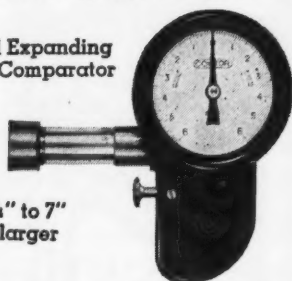
A production tool, smooth in operation, engineered to fill a broad field where a fast bench unit can be used most advantageously. It saves time by taking the part to be machined to the grinder instead of taking the grinder to the part as in the case of a portable tool. It leaves the operator with both hands free which to handle the work; the result, much more production. 3 stages of power.

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DETROIT 26, MICHIGAN

**"Matched Gaging" to
fractions of .0001" with
COMTORPLUG**

Patented Expanding
Internal Comparator



Sizes: 1/4" to 7"
dia. and larger

By combining high precision with unique simplicity, Comtorplug enables operators, bench inspectors and final inspectors to use the same gage, improving quality and lowering rejects. Shows actual size; detects out-of-round, front or back taper, barrel shape, bell mouth, etc.

Request Bulletin 29

THE COMTOR CO.
45 RUMFORD AVE. WALTHAM, MASS.

**REYNOLDS
COOLANT UNITS
ARE EFFICIENCY EXPERTS!**

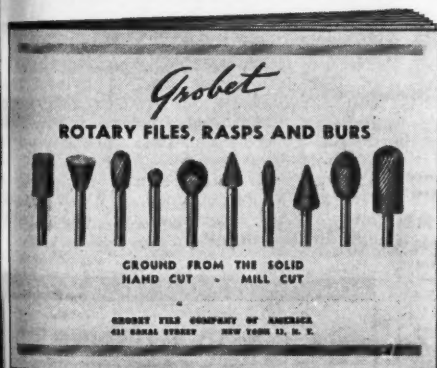


Showing Reynolds
No. 1-S attached to
milling machine

Designed to promote peak performance in machines using a coolant (cutting or soluble oils), Reynolds Coolant units are the answer to demands for increased production and longer cutting tool life.

REYNOLDS MACHINERY CO.
211 EDDY STREET, PROVIDENCE, R. I.

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Just off the press—the most complete of its kind, illustrating the full line of GRO-BET ROTARY FILES, CUTTERS, DIESINKER'S BURS, etc., in size, shape and coarseness of cut for every industrial purpose.

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Catalog KR on your firm
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used with the Bemisine to determine angles. All working surfaces of the device are ground to a high finish, true and parallel, and suitable hand and positive locks are provided to retain accuracy of setting.

"Quadrill"

Said to increase the capacity of any drill press four times, a turret attachment to be known as the "Quadrill" is now being offered by the Chicago Drillet Corp., 919 N. Michigan Ave., Chicago

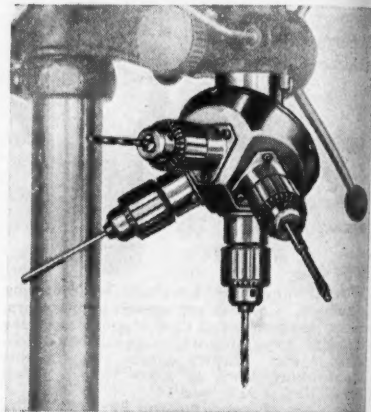
GRAY TURRET HEAD METAL CUTTER OR NIBBLER



**GRAY, Originator of
First Practical Metal
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Most modern Nibbler for
Template Cutting, Tool
Rooms, Shipbuilding, Air-
craft Parts, Aircraft Tub-
ing, Sheet & Plate Shops.

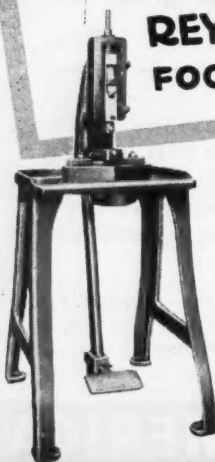
GRAY MACHINE CO.
Box 596, Philadelphia, Pa.



"Quadrill"

Quadrill is said to allow for the performing of drilling, counterboring, reaming, center-drilling countersinking, spot-facing, and other operations on the machine. Only the tool in working position rotates while the other three remain stationary for safety purposes. The entire unit is attached to the quill of the drill press and is driven from the spindle. According to the manufacturer, hardened friction starter and driver assure clash-free synchronization of the driver teeth. The four hardened and ground spindles are designed for No. 32 Jacobs chucks or their equivalent. Ball bearings are used in all spindle assemblies.

REYNOLDS FOOT PRESS



**\$65 Complete
as shown**
**F. O. B. Providence
(Crating \$5.00 Extra)**

SPECIFICATIONS

Full Length stroke $2\frac{3}{8}$ "
Greatest distance from
bottom of plunger
to platen $5\frac{3}{4}$ "
Length of Collet $1\frac{1}{2}$ "
Distance between center
of plunger and
back of press $3\frac{3}{8}$ "
Distance between centers
of stud bolts $7\frac{1}{8}$ "
Floor space $22" \times 22"$
Weight about 300 lbs.

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| | |
|------------------|--------------|
| Bronze | Pipe |
| Cast Iron | Rails |
| Hard Alloys | Soft Steel |
| (Med. Dia.) | Tool Steel |
| Hard Alloys | (Large Dia.) |
| (Large Dia.) | Tool Steel |
| Heavy Angle Trim | (Med. Dia.) |
| Iron Pipe | Tubing |
| Light Angles | Wrought Iron |

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| Aluminum | Drill Rods |
| Brass Sheets | Iron Sheets |
| Builder's Board | Metal Wood |
| Cast Iron | Monel Sheets |
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| | Zinc |



This metal cutting book tells you the proper selection and use of Hand and Power Hack Saw Blades and Flexible Back Band Saws for the materials you cut. Send for your copy. Clemson Bros., Inc., Middletown, New York.

*T. M. Reg.—Blades bearing the name "MOLLY" are made only by Clemson Bros., Inc., and its affiliated companies.

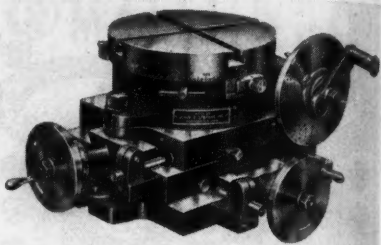
CLEMSON

Makers of Hand and Power Hack Saw Blades, Flexible Band Saws, and the Criterion H.P. Machine Grinder.

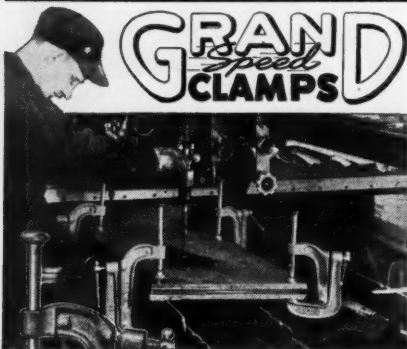
Stevens No. 1 Compound Table

To meet the need for a fixture to provide longitudinal and transverse movements in connection with the circular movement of its small or 7½-inch rotary table, John B. Stevens Inc., 482 Canal St., New York 13, N. Y., is now offering a compound table designated as the No. 1.

While the accompanying illustration shows the compound table being used with a rotary type table, it is also available as a separate item for various other uses. A series of drilled and



Stevens No. 1 Compound Table used in connection with rotary type table



QUICKET for Faster Production—Tighter Holding

Can be set in 4 seconds and released instantly. Ratchet set with side screw powerful fulcrum tightening. One-hand operation with absolutely non-creeping grip even on irregular surfaces. Ideal for multiple clamping operation. Can be instantly re-set to other work of same thickness.

Send for New 32-Page Catalog

GRAND SPECIALTIES COMPANY
3102 West Grand Ave. Chicago 22, Ill.

tapped holes can be located in the top slide of the table for strapping down workpieces. Both the longitudinal and transverse screws of the table are provided with adjustable micrometer collars. Buttons to allow for the use of size blocks are also provided.

Specifications of the Stevens No. 1 Compound Table are as follows: height, 3½ inches; longitudinal movement, 3¼ inches; transverse movement, 3¼ inches; area of top slide, 7 x 7 inches; width of base left to right, 12¾ inches; depth of base front to back, 9¼ inches; net weight, 57 lb.; shipping weight, 76 pounds.

Pines Automatic Reaming and Burring Profiler

A combination automatic reaming and burring profiler for handling tubes up to 6 inches O. D. and from 3 to 60 feet or longer is announced by Pines Engineering Co., Aurora, Illinois.

The head assemblies, which consist of the spindles and chucks, are mounted on heavy cars having flanged wheels



EXPANDING MANDRELS

Any size hole within a 1" range of infinite variation! That's what one size Champion Expanding Mandrel will completely and accurately handle. The hardened steel flexible sleeve automatically expands to the correct size as it is raised on the tapered arbor. Only 12 champions needed for range from ½" to 6½". Eliminates numerous solid mandrel sizes. More convenient. Costs ⅓ less. Proved for years by thousands of shops.

THE WESTERN TOOL AND MANUFACTURING CO.
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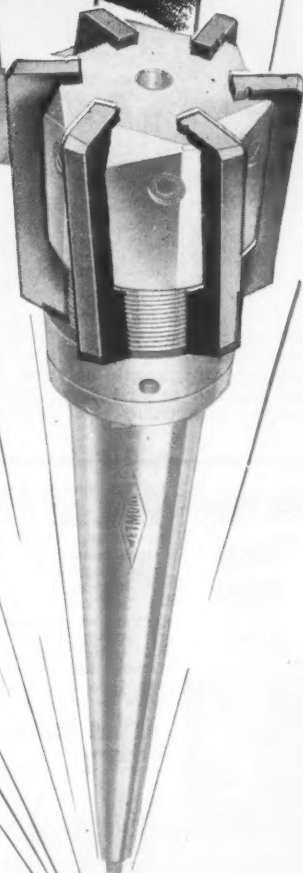
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Cut Reaming Costs

Greater
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In this effort Wetmore has developed Ream-Mor Processed blades . . . harder—longer wearing—tough—high speed steel blades with qualities of premium alloys at a cost comparable to ordinary high speed steel blades. Try a set on your Wetmore Reamers and see for yourself.

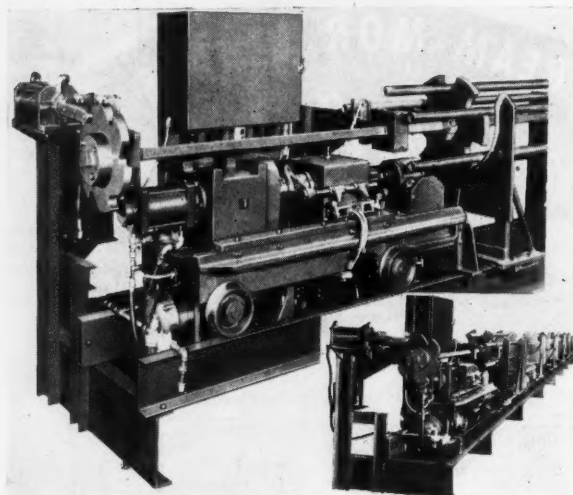
If you have a special reaming problem, Wetmore engineering and experience is at your service.

Send for the New REAM-MOR blade bulletin for complete details.

WETMORE REAMER CO.

416 North 27th Street, Milwaukee 8, Wis.





Pines Automatic Reaming and Burring Profiler

chanism which selects tubes from storage rails regardless of diameter. The indexing mechanism, automatic self-centering type chucks, and the spindle advance are all actuated by hydraulic cylinders. The control panel houses the relays, motor starters, and other electrical accessories required for automatic cycle operation.

According to the manufacturer, a production of 200 to 400 tubes per hour can be obtained on end facing and burring operations and 100 to 200 tubes

which operate on channel iron track. One car can be moved to position for processing any length of tube desired. Tubes are fed to and from profiler by means of automatic reel feeding me-

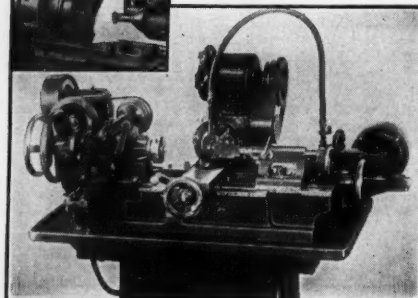
per hour where an additional operation of inside reaming is required. The same type profiler is also used for threading, flaring, burring, turning, boring, and chamfering pipe and tubing.

WALTHAM Thread Miller

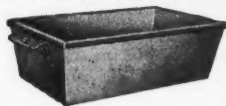


For threading small parts. It will cut V, N.S., Acme, Whitworth and Metric threads, special threads. Special head for internal threading is shown in insert at left. Special head for relieving can also be furnished. Send us drawings or samples and we will gladly submit our suggestions, no obligation. Also makers of Small Milling Cutters, Sub Presses, Pinion and Gear Cutting Machines. Write for illustrated bulletin.

Waltham Machine Works
Waltham • Mass.



New Nesting Type Tote Pans



20" long x 12" wide x 6 1/2" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.
Bridgeport, Conn.



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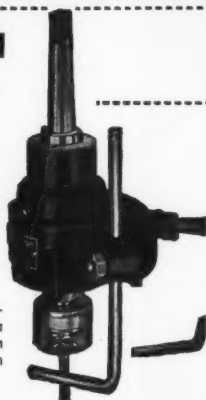
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**friction
or positive
drives.**

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construction.



No. 1 Tapper friction or positive drives 2-56 to $\frac{3}{8}$ "
taps in steel or any other material. No. 2 positive
tapper drives $\frac{3}{8}$ " to $\frac{3}{4}$ " tap in steel or any other
material and No. 3 drives $\frac{1}{2}$ " to 1" in steel or
any other material. Delivery from Stock Some Sizes.

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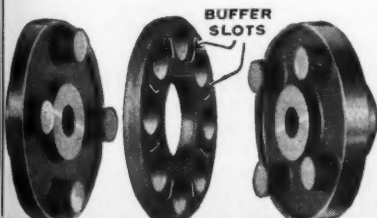
DORMAN MACHINE TOOL WORKS

357 CANAL ST. • NEW YORK 13, N. Y.

USE CUSHION TORQUE —IT INCREASES OUTPUT

The **BUFFER-SLOT COUPLING** lengthens the life of your Motor-Driven Machines by reducing wear and absorbing the load-shock and vibration that are the sources of most machine failures. It gives you all the advantages of the ordinary coupling and in addition restores to your Direct Drives that protective resiliency you lost when you discarded the Belt Drive. It is a long-lived dependable device especially valuable for use with Ball or Babbitt Bearings.

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Take deeper cuts and heavier loads at higher speeds. High precision ball and taper roller bearings. Four inserts are easily and quickly interchangeable for centered and uncentered work. Accepted as standard in leading tool and machine shops.

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Effective for checking all machine tool speeds. Equipped with a wheel for measuring surface speed in feet per minute. Used as "Hand" type or with generator separated from meter as "Separable" type. Two ranges—0 to 2500 RPM and 0 to 5000 RPM.



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Sales Offices in All Principal Cities.

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December, 1944

MODERN MACHINE SHOP 345



C-Type Snap Gage Spindle for Precisionaire Instrument

The introduction of a C-type snap gage spindle for use with the Precisionaire instrument is announced by The Sheffield Corp., Dayton 1, Ohio. An ad-

Illustration showing C-type snap gage spindle being used in conjunction with Precisionaire instrument to check a shaft. Inset shows close-up view of the snap gage spindle.

vantage claimed for the spindle is that it can be used on highly finished or soft plated parts without marring or scratching them. It can also be used on thin-walled cylinders without any danger of collapsing them, the manufacturer states. Two other principal uses of the spindle are for checking work while in machine and for checking parts of large size or unwieldy shape which cannot be presented

to the gage.

The accompanying illustration shows the C-type snap gage spindle being used to check a shaft. By using the Precisionaire, the dimensional quality can be checked to a fraction of a ten thousandth of an inch, it is stated.

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HAND STAMPS LOGOTYPES DIES STANDARD
AND SPECIAL STAMPS INSPECTORS' STAMPS
MACHINE ENGRAVING PRECISION DUPLICATING

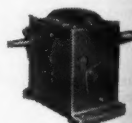
NEW METHOD STEEL STAMPS, Inc.
149 Joseph Campau, Detroit 7, U.S.A.

Into Abart Speed Reducers go ---

- Heat-treated nickel chromium steel
- Nickel molybdenum steel
- High grade gear bronze
- Full ball or roller bearings
- Dust-proof, oil-tight housings



TYPE ACU



Type DW

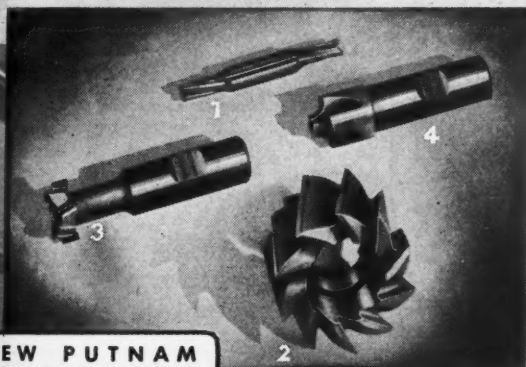
Abart SPEED REDUCERS

Today's standard of long-lived accuracy. Over 75 types and sizes—worm, spur, and combinations. Send for complete catalog.

ABART GEARS: Precision-cut to specifications. No stocks. Ask for estimates.

ABART GEAR & MACHINE CO.
4819 W. 16th St. Chicago 50, Ill.

Now . . . A TOTAL OF
1023 ITEMS
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 READY TO BE SHIPPED IMMEDIATELY



**NEW PUTNAM
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- 1 Spline Mill
- 2 Heavy Duty Shell End Mill
- 3 T-Slot Cutter
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The addition of new sizes and types of present End Mills, Reamers and Counterbores to provide greater and more complete range, and many new items (a few illustrated above), make today's Putnam standard cutting tool line the greatest in our history. Our new 92-page catalog illustrates and lists every item. Your copy will be sent without obligation if request is made on your company letterhead.

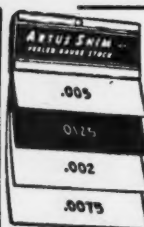
Tools
 THAT CUT FASTER
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PUTNAM TOOL COMPANY

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ARTUS PLASTIC SHIM & FEELER GAUGE STOCK

The **COLOR** tells
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Long lasting plastic, replaces scarce metal. Each thickness a distinctive, easy to identify color. Impervious to oil. 5"x20" sheets. Special sizes to order. Handy assortment, shim stock, 12 colors—12 thicknesses (.001-.030). Bound together. \$3.75.

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Hand Operated • Lever Action
Will Cut 1" and Smaller
Wire Rope.
A compact, handy machine
built for endurance.

Price \$80.00 Weight 110 lbs.
Catalog No. 8 Available.

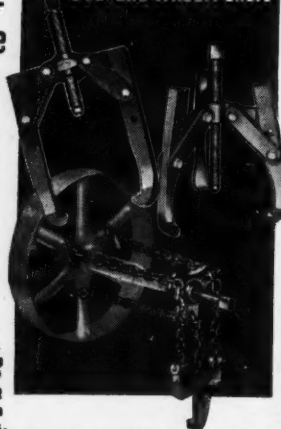
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No. C

The Complete Line of Gear and Wheel Pullers

ARMSTRONG-BRAY

Gear and Wheel Pullers



Write for Catalog Sheet
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STEELGRIP
Standard 2
and 3 arm
Wheel Pullers,
special Battery Terminal, Pitman Arm, Fan
Pullers and CHAINGRIP Universal Pullers.

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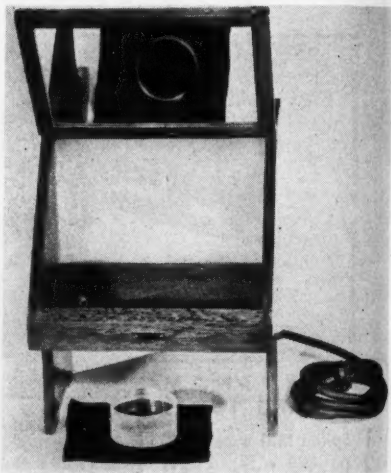
"The Belt Lacing People"

5346 Northwest Highway, Chicago 30, U.S.A.

Van Keuren Laboratory Monochromatic Light

The Van Keuren Co., 177 Waltham St., Watertown 72, Mass., announces an improved monochromatic light for laboratory use. The light as shown in the accompanying illustration is intended for use in comparing gage blocks for size and for checking optical flats and ultra precision surfaces, where an accuracy of one or two millionths of an inch in the final result is required.

With the unit, monochromatic light is



Van Keuren Laboratory Monochromatic Light

transmitted through a vertical ground glass screen and is reflected downward to the surface being inspected by a 45-deg. inclined clear sheet of glass. The light is then reflected upward by the surface being tested and the optical flat and directly through the 45-deg. inclined glass where it is again reflected by a 45-deg. inclined mirror to the eye of the observer.

An advantage of the Van Keuren Laboratory Monochromatic Light is that the line of vision is nearly perpendicular to the surface being tested. The greater the distance the observer is from the surface being tested the more perpendicular is the line of vision on all points on the surface. This distance is limited only by the width of the room in which the light is used. With the light, light wave bands have their correct value of 0.00000116 inch per dark band.



We require

Three sales-minded men familiar with all metal working and degreasing processes.

They need not have had any actual selling experience . . . but their previous connections must have qualified them to conduct intelligent, factual, sales producing interviews on coolants, solvents and detergents. They must be between 28 and 35 years of age. They must have a desire for security and permanency with a nation-wide organization that can give them an unusually attractive opportunity now . . . and unlimited possibilities in the post-war period.

THE DUBOIS COMPANY
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SHELDON LATHES

Wherever our U. S. Armies go, SHELDON LATHES move with them for they are basic equipment in the Army's Mobile Machine Shops and Mobilized Instrument Repair Shops.* These compact truck-mounted machine shops are found wherever the going is toughest, keeping all mechanized ordnance operating efficiently.

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SHELDON MACHINE CO., INC.
4250 N. Knox Ave.
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HALLOWELL

— the right equipment for the job

Just one of many popular items in the "Hallowell" Line of Steel Shop-Equipment is the Work-Bench shown at the right. It's exceptionally strong and sturdy — built to stand firm and rigid without bolting to the floor. Available in over 1300 ready-made, interchangeable combinations, adaptable to almost any job. Priced right for you.

To be informed about our Benches, Tool Stands, Trucks and other items, send for the "Hallowell" Catalog.



Drawer is extra
Pat'd and
Pats. Pend.

Fig. 928



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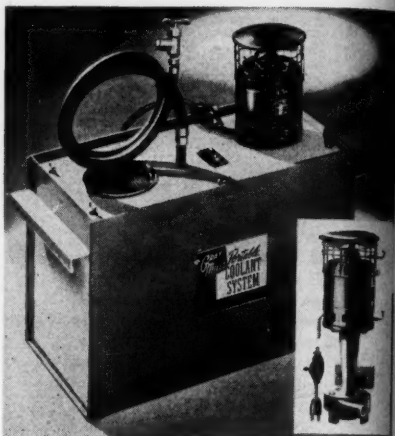
BOX 356

Branches — Boston • Detroit • Indianapolis • Chicago • St. Louis • San Francisco

Gray-Mills Model 1130 Portable Coolant System

Designated as the Model 1130, a portable coolant system for use in connection with grinders, cut-off saws, milling machines, and other units is announced by the Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill. The coolant flow provided by the system is adjustable from a trickle to a full stream.

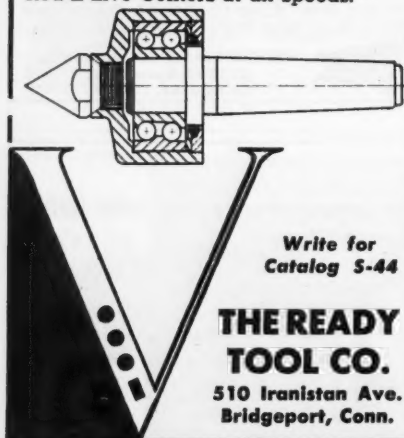
The Model 1130 system is simply and sturdily constructed and is supplied ready for immediate plug-in operation. Compactly designed, the unit can be



Gray-Mills Model 1130 Portable Coolant System

CENTER POINTS RUN TRUE and STAY TRUE

at All Speeds because a double-row preloaded precision bearing and ground-after-assembly point contribute to the accuracy and rigidity of Red-E Live Centers at all speeds.



Write for
Catalog S-44

**THE READY
TOOL CO.**

510 Iranistan Ave.
Bridgeport, Conn.

easily located under a machine or other out-of-the-way place. Forced-setting baffle plates are built into the tank to reduce circulation of solids.

The heart of the G-M Model 1130 Coolant System is a Gray-Mills Model 1100 Centrifugal Pump with a capacity of 1200 g. p. h. (water) at 0 head; 360 g. p. h. at 5-foot head. The motor of the pump is a 1/5 h. p., sealed-bearing unit.

The G-M 1100 Pump is also designed for built-in coolant systems and for use as a general purpose pump for sumps, and so on. The mounting bracket provided allows for either vertical or horizontal attachment of the pump, or the unit may be rested on its base of three legs. According to the manufacturer, abrasives or chips pass through the pump without binding or abrading; thus wear is negligible. The motor, it is

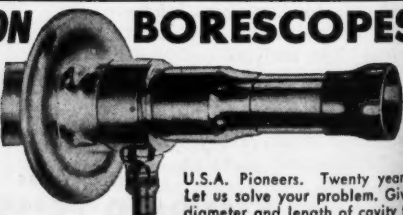
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LENOX Instruments explore the dark holes of industry—guns, turbine rotors, hollow shafts, tubes, tanks, well drill pipe, cartridge cases, etc.

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U.S.A. Pioneers. Twenty years. Let us solve your problem. Give diameter and length of cavity to be inspected.

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THRIFTMASTER



Your parts blueprints will bring recommendations and quotations. Literature on request.



High Production - Money Making
MULTIPLE SPINDLE DRILLHEADS



THRIFTMASTER PRODUCTS

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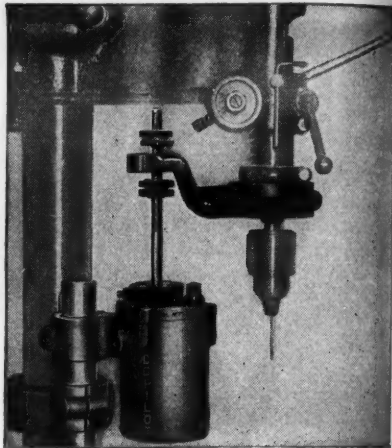
ZIMMER-THOMSON CORPORATION

29 05 Revere Avenue Long Island City 1, New York

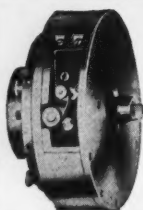
claimed, cannot be overloaded when discharge is cut down or stopped.

Copilot Drill Press Feed Regulator

Constructed for quick and easy attachment to hand feed drill presses, a drill press feed regulator designated as the Copilot is now being marketed by Special Devices Co., Berlin, Conn. Use of the regulator is said to prevent sudden contact of drill with work at start



Copilot Drill Press Feed Regulator



M-D Facing Heads With Automatic Feed

Can be attached to Boring Mill Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically. Sizes 6" to 46" diameter.

Write for circular.

MUMMERT-DIXON CO.

120 PHILADELPHIA ST.

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Save Time on WAR ORDERS

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BEVERLY Throatless Shear

If you're cutting straights and irregulars on "War" jobs, you can speed 'em up with a BEVERLY. Write for sizes and prices now!

BEVERLY SHEAR COMPANY

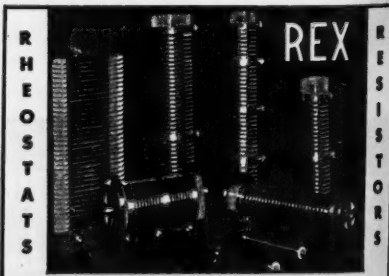
3004 W. 111th St.

Chicago 43, Ill.

of drilling operation, and prevent dropping of spindle when drill breaks through opposite work surface. In addition, all backlash in spindle feed mechanism is said to be eliminated, thus making the regulator particularly useful in the drilling of plastics and thin materials.

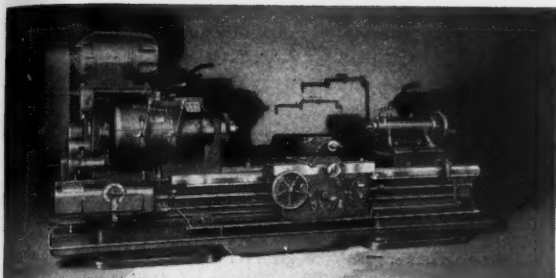
Designed to minimize fatigue and nervous tension in small-hole drilling, the Copilot, according to the manufacturer, can be operated by merely pulling down feed lever with one hand. Self-lubricating, the unit operates on the hydraulic principle and includes metering valve which is said to automatically clear itself, thus preventing clogging.

In addition to the standard model shown, the Copilot drill press feed regulator is available in a special model engineered to specific jobs and providing variable regulating characteristics.



REX RHEOSTAT CO.

• Baldwin, N. Y.



Engine Lathes

THE BOYE & EMMES MACHINE TOOL CO. CINCINNATI OHIO

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BUTTE Sullivan Valve & Engineering Co.
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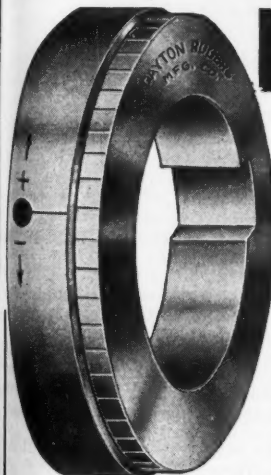
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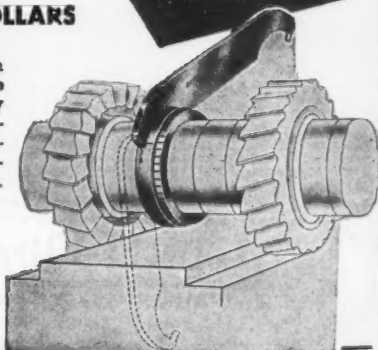
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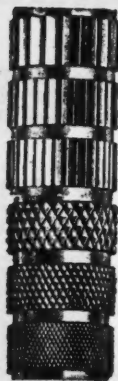


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Any size or shape—fabricated to fit old or new machines. Why make cast bases when fabricated units give the necessary strength and durability, yet cost less. Send blueprints to Littleford for prices and delivery.



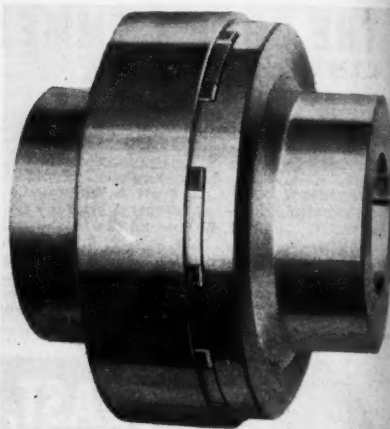
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LITTLEFORD BROS., INC.
433 E. Pearl St., Cincinnati 2, Ohio

L-R Type "C" Flexible Coupling

Designed so as to protect workers against possible injury due to catching of clothing or incautious handling, a shrouded flexible coupling designated as the L-R Type "C" is announced by the Lovejoy Flexible Coupling Co., 5007 W. Lake St., Chicago 44, Illinois.

Principal feature of the coupling is the outside steel collar which holds the load cushions in place. An extension of this collar, which encircles the coupling, safe-guards materials and fingers



L-R Type "C" Flexible Coupling

from the heads of the bolts that hold the load cushion retainer. The bolt heads are concealed, yet can be easily and quickly reached when necessary.

The L-R Type C Flexible Coupling is designed for heavy duty services from 4.60 to 806 h. p. at 100 r. p. m. The individual free-floating load cushions between the rugged jaws are held in position by inside steel sleeve and removable steel collar of the coupling. The coupling can be furnished in types for directly attaching to flywheels; also in drum and other types for rapid disassembly without disturbing drive or driven equipment, and so on. Cushions of various materials are available.

Topflight Broken Drill Adapter

Available in sizes to fit all types and sizes of drills, a broken drill adapter of one-piece construction has been

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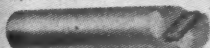
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... YOU CAN OBTAIN 60% TO 80% OF YOUR CARBIDE REQUIREMENTS

From This Catalog

Precision Boring Tools



Two types: (1) carbide tipped (with flat top or back rake) sizes 1/8" through 1/2" dia. (2) solid carbide 1/8" through 1/2" dia.

Lathe and Grinder Centers

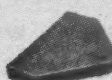
(Up to 50 times longer life than steel)

Carbide tip only



Finished tipped centers (with Morse, B & F, and Jarno Tapers)

Special-Purpose Standard Stock Carbide Cemented Carbide Blanks



Pointed Nose Blanks



Reamer Blanks for 1/2" and 1/4" sizes

Reamer Blanks 11 Standard

General-Purpose Standard Carbide Blanks



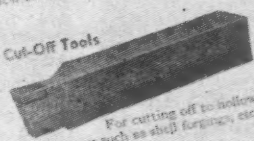
Style 1000



Style 2000

For emergency tooling, these Carbide blanks to your own standards. More than 100 standard shapes available for cutting steel, cast iron, non-ferrous metals and non-metals. Sizes 1/16" to 1/2" thick.

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For cutting off to hollow cores such as shell furnaces, etc.

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For W.S. Casts and Lanes & Turners. Extra long life and special shapes for long period of tool life. Eleven standard sizes carried in stock.

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Standard Turning, Boring, Facing Tools for Steel, Cast Iron, etc. (You can grind to hundreds of special shapes. Wide range of sizes.)



Style 4 (Style 7, left hand)



Style 13 (Style 14, left hand)



Style 5 (left hand)



Style 10 (left hand)



Style 11

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Topflight Broken Drill Adapter



Sump Tank Cleaning Machine illustrated herewith, product of the W.

placed on the market by the Topflight Tool Co., P. O. Box 6728, Towson 4, Maryland.

To use, the broken drill is inserted in the adapter and held in place by a patented self-locking device, thereby instantly becoming a useful tool. Vibration is said to increase the gripping action provided by the locking device, however, the broken drill can be easily ejected when desired. The adapter is also claimed to be particularly useful for extension drilling in aircraft plants and shipyards.

Carnes Model 20-T Sump Tank Cleaning Machine

Designed for use with grinders, lathes, screw machines, honing machines, and other equipment, the Carnes Model 20-T

R. Carnes Co., Madison 4, Wisc., is a compact, portable unit constructed for easy handling of one operator. Adaptable for removing all types of cutting oil, the unit consists of a 100-gallon tank mounted on two 8-inch roller bearing rigid casters and a swivel tongue 8-inch wheel for easy movability. A sludge basket provided in the manhole of the tank separates chips, sludge, and so on, from the oil or coolant.

The pump and motor unit located on top of the tank rests on special slides and, by removing one screw, may be lifted from one tank to another, making one pump unit suffice for several tanks. Due to a patented construction, no oil, coolant, sludge, or chips are said to pass through the pump proper; thus, priming, excessive wearing, or clogging of the pump is eliminated. According to the manufacturer, the unit will pump any liquid that will flow re-

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Faster TAPPING AND REAMING

By reducing set-up time, the Ziegler Floating Holder makes it possible to get production under way much more quickly than with ordinary holders.

Try it and see! The man-hours you save will pay for it many times over in the course of a year.

W. M. ZIEGLER TOOL CO.

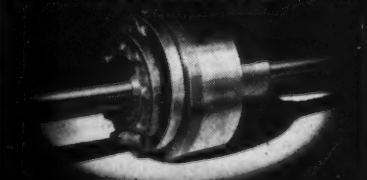
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for Taps and Reamers...

★ ★ THE HILLIARD ★ ★



SINGLE REVOLUTION *Clutch*

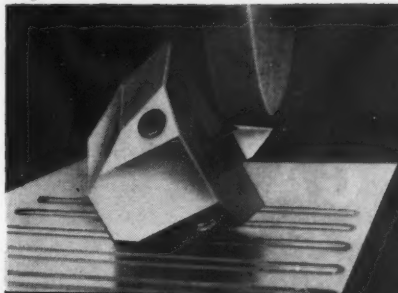
W. Hilliard's extremely accurate control of intermittent machine operation is essential. The Hilliard Single Revolution Clutch is unequalled. Its accuracy has won for it the acceptance of industry for cutting, punching and packaging machinery.

WRITE TO DAY!

For information that will help you to select the clutch for your job.

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both 29° and 60°
THREAD TOOL BITS

Accuracy, uniformity, and precision are assured in grinding both Acme 29° and National 60° left or right hand thread-tool bits, with or without rake on the cutting face. No graduated scales or moving parts to wear out. Two sizes, complete with adapters: Model A for the mechanic's tool kit \$16.75... Heavy Duty Model B for the shop \$35.00.



Fixture can be easily clamped to work table when magnetic chuck is not available.

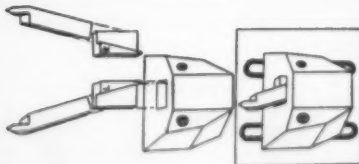


Diagram shows how to grind 15° right and left hand bent tools with standard adapters.

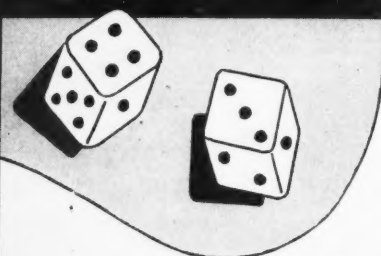
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Invincible angle tool attachments make your portable drills universal for any operation by converting them into angle tools in a few minutes.



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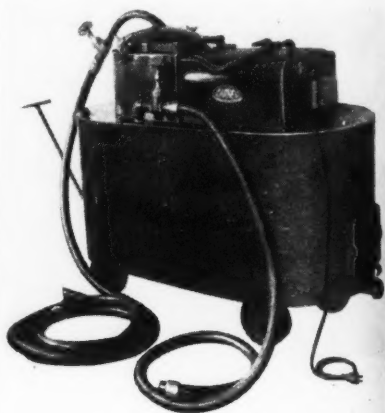
6111 Empire Bldg., Pittsburgh 22, Pa.

Makers of Job Tested and Job Proven Tools

regardless of corrosive action of the material, amount of solids, sludge, and so on, that the liquid will contain.

Additional features of the Model 20-T machine include a $\frac{1}{2}$ h. p. heavy duty motor, fully automatic controls, signal light to indicate when tank is filled, and 20-foot long x $1\frac{1}{4}$ diameter Neoprene suction hose with 4-inch cleaning nozzle.

Specifications of the Carnes Model 20-



Carnes Model 20-T Sump Tank Cleaning Machine

T Sump Tank Cleaning Machine are as follows: length, 52 inches; width, 30 inches; height, 52 inches; clean-out door, 6 x 10 inches; tank body, 10 gauge steel; base, 2 x 2 x $\frac{1}{4}$ -inch angle; sludge compartment, 14 inches diameter x 15 inches deep; sludge basket capacity, 85 pounds.

Blank & Buxton Micro-Turnthread Lathe Attachment

Designed to overcome the difficulty encountered in turning or threading long, small diameter shafts, a versatile lathe attachment to be known as the Micro-Turnthread has been developed by the Blank & Buxton Machinery Co., 3100 E. Michigan Ave., Jackson, Michigan.

The device is a combination toolholder and follow rest which is installed in the lathe tool post. Embodied in the toolholder are rollers with screw ad-

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2 HOLDERS
2 KEYS**
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only \$49⁵⁰

Here's What You Get!

- 1 Abrasive diamond tool with 25 carats of diamonds for straight dressing wheels up to 20" x 1 1/2"
- 1 Abrasive diamond tool with 30 carats of diamonds for straight or form dressing up to 12" x 1"
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- 1 Abrasive chisel-type diamond tool for all sizes of radii
- 1 Abrasive Red Band with diamond at 65° included angle for 0.020 radius and larger
- 1 Abrasive Red Band with diamond at 85° included angle for 0.025 radius and larger
- 3 Abrasive Phonopoints for 0.015 radius and larger
- 1 Abrasive Diamond Scriber
- 2 Abrasive Tool Holders
- 2 Sturdy Keys

Important: If your supply house has not yet stocked this G-P Kit, have them place your order . . . or place your own order direct for **IMMEDIATE DELIVERY!**

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December, 1944

MODERN MACHINE SHOP 359



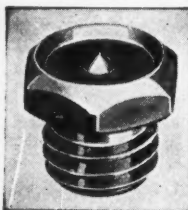
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Equip your shop with Yohe Storage Racks — Save floor space — Prevent damage to stock—Speed up handling. Yohe Storage Racks are cast of high-grade machinery iron and can be furnished in capacities of 10,000 and 12,000 pounds for storing bars 10 to 20 feet long.

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By JOHN T. SHUMAN, Coordinator, Williamsport Technical Institute, and LEWIS H. BARDON, Instructor in Tool-making, Williamsport Technical Institute

Gives new and semi-skilled operators the information they need. Presented in simple, easy-to-grasp question and answer form. Ideal for shop training programs. Complete with tables, charts, worked-out examples, decimal equivalents, diagrams. Profusely illustrated with clear photographs of machinery parts and tools.

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Please send me on ten day's approval a copy of Shuman & Bardo's HOW TO OPERATE A LATHE. At the end of that time, if I decide to keep the book, I will remit \$1.75 plus postage; otherwise I will return the book postpaid.

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justments for variation in work diameter. Micrometer adjustment of the cutting tool itself is provided, as well as a quick retractability feature for moving the tool in and out at the beginning and end of threading cuts. Retraction is effected by means of a toggle.

The Blank & Buxton Micro-Turnthread Lathe Attachment is available in two models for right or left-hand operations. The Model A is intended primarily for turning and threading operations, and is also said to be suitable for

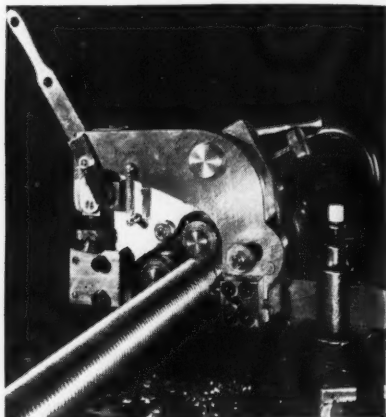


Illustration showing Model A Blank & Buxton Micro-Turnthread Lathe Attachment being used in the cutting of Acme threads on a shaft

light forming and cutting-off operations. The Model B, which is designed to allow for quick changing of tools through the use of a separate holder for each tool, can be used for drilling, plunge cutting to size, and cutting-off duplicate parts with precision.

Films

Internal Grinding Tooling Film

Of special interest to plant engineers, tool and fixture designers, grinding room foremen, production men, and so on, a full-color Kodachrome motion picture entitled "Tooling for Better Internal Grinding" has been completed by the Bryant Chucking Grinder Co., Springfield, Vt. The film thoroughly covers many of the problems encountered in the toolroom and in mass production, and

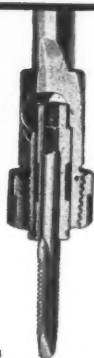
Improved Tapping Head



- Better Design Lines
- Increased Output
- More Accurate Work
- Less Tap Breakage

The Tru-Grip Tap Holder, for instance, weighs one-third as much as conventional chucks, which kills fly wheel effect and promotes more accurate tapping. The tap holders have small outside diameter: $\frac{3}{4}$ " for No. 1, 1" for No. 2, $1\frac{1}{4}$ " for No. 3—which permits use of tapping head in hard-to-get-at spots. Shank is one piece, heat treated and precision ground.

Tap is driven by square and held true by the round. Many other features include: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balanced, heat-treated gear reversing mechanism which distributes pull and greatly reduces strain.



Cross section of Tru-Grip Tap Holder showing positive drive to tap.

External Threading

Standard Procunier Tapping Heads can be equipped for external threading. Produce accurate work and increase output.

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giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs. The new Tru-Grip Tap Holder—and also the full line of Procunier Universal Tapping Machines.

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Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.

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answers the questions of the aforementioned individuals. It shows the importance of universal tooling for small lot production, standard tooling adopted to production work, and special tooling to enable combining several operations in one chucking. It also shows both plunge and transverse methods of irregular contour grinding.

The film is 1,600 feet long and has a projection time of 40 minutes. It is available for free showing to clubs and engineering societies. Equipment required for showing the film comprises a 16 mm. sound motion-picture projector, one empty 1,600-foot capacity reel, and suitable screen.

Tracer-Controlled Milling Film

A 30-minute sound and color motion picture showing many new techniques in tracer-controlled milling, engraving, etching, and duplicating has been completed by the George Gorton Machine Co., 1709 Racine St., Racine, Wis. Entitled "An Exact Duplicate," the film is designed to provide its audiences with short-cut solutions to post-war produc-

tion problems. It affords production men an opportunity to see tracer control at work on actual jobs and to hear simultaneously a description of the work as it progresses.

More than a year in production, "An Exact Duplicate" was filmed under the supervision of Gorton engineers, and all jobs shown in the picture were photographed in a machine shop. An excellent application of close-up photography shows all features of work, master, and machine. The sound commentary clearly describes each operation and enables even those not familiar with the operation of tracer-controlled machines to understand their application to these jobs.

"An Exact Duplicate" is available without charge for showing at meetings of technical societies, company groups, and so on. Arrangements can be made by writing to the George Gorton Machine Company, giving full information and the showing date desired together with two optional dates.

Gasket Film

Goetze Gasket & Packing Co., Inc., 17 Allen Ave., New Brunswick, N. J., now has available a 16 mm. color and sound film telling of the great importance of gaskets in industry—of the research and manufacturing facilities employed in this highly-specialized business of sealing the joints in vital equipment against the effects of high temperatures, pressures, corrosion and other service conditions.

Entitled "Only a Gasket," the film with commentary by Lowell Thomas, has a running time of approximately 35 minutes and is available to employee groups, technical societies, engineering schools, and other organizations making application on official letterhead.



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